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Cover

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Service Operations on Crosley "Q" Compressors

All Crosley "Q" units manufactured from 1932 to 1939, inclusive, are the conventional belt-driven reciprocating type, using sulphur dioxide as the refrigerant. All compressors during this time contained 10 ounces of oil, and all systems equipped with the "Q" compressor employ a capillary tube as the refrigerant control.

The "Q-1" unit was the first manufactured and has continued in its original design with a few minor changes up to the present year. The compressor is a single-cylinder reciprocating type, with the suction line entering the crank case. A wafer-type suction valve is located in the top of the piston. The shut-off valves are located on the suction side and the discharge side of the compressor. No shut-off valve is used in the liquid line, and no receiver is employed on the unit. During repairs to the system, the refrigerant charge is either held in the evaporator or entirely removed from the system. The refrigerant passes directly from the fin type condenser through a filter and the capillary tube into the evaporator. The capillary tube causes a restriction which permits liquefaction of the SO_2 in the condenser and vaporization of the liquid in the evaporator. The evaporator is the flooded header type. The refrigerant charge varies from 15 to 34 ounces, depending on the evaporator size and style.

On all capillary tube systems, nearly all the refrigerant is held in the evaporator during operation. The proper charge is determined when it is observed that the evaporator is full of liquid, and therefore, the size of the evaporator determines the total charge of the system.

The 1933 "Q" unit is the same as the 1932, except that the condenser is mounted on the unit frame, rather than on the floating base. The capillary tube is connected to the filter and evaporator by means of capillary tube nuts instead of being soldered directly into the evaporator and the filter. When the capillary tube is being replaced, these nuts also must be replaced since they cannot be used over again.

In 1934, the only added feature was that of interior lights, which did not change the servicing operations and meant only a slight change in the wiring diagram.

The 1935 unit was almost identical to the 1934 unit, the only change being a new type light socket and switch assembly.

In 1936 the "Q-3" unit was introduced, which is essentially the same as the "Q-1"

unit, but with the following changes: The "Q-3" unit is built more compactly, using a twin-belt drive and a different suspension bracket and spring. The evaporator is mounted centrally in the cabinet instead of to one side. Service operations on the "Q-3" are identical to those on the "Q-1" unit.

In 1937, 1938, and 1939, both the "Q-3" and the "Q-1" units were manufactured. The "Q-3" unit is the twin-belt drive, while the "Q-1" is a single-belt drive. Service operations on both are the same as on former "Q" units.

The Service Valves

The two compressor shut-off valves are conventional two-way valves with a double seat so that gauges may be attached without loss of refrigerant or special adapters. They differ in service operations, however, because of the manner in which they are attached to the compressor. Most compressors have the

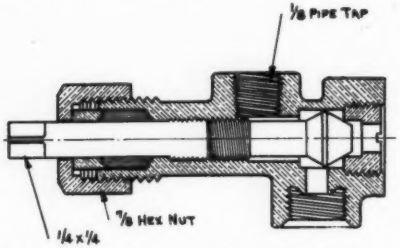

Fig. 1. Type of service valve used on Suction and Discharge sides of Compressor.

side outlet of the valve connected into the compressor and the end outlet into the evaporator or condenser. The side outlet of the Crosley valve is connected to the condenser or evaporator and the end outlet to the compressor. When the valve stem is turned all the way in on the Crosley unit, the gauge port is opened to the suction line instead of to the compressor, as on other open type units. With this arrangement it is not possible to test the compressor valves with a compound gauge.

Testing for Loss of Charge

If part of the sulphur dioxide has been lost through leaks, refrigeration will be made inadequate. When the unit is properly charged, the suction line will frost three or four inches back from the evaporator. If some charge has been lost, the header of the evaporator will not frost. Other indications of a low charge are:

a. When the unit is operated the suction pressure will go to a vacuum, (that is it will "pull down"), much more rapidly than normally if the charge is low.

b. The wattage used by the motor is less than normal if the charge is low.

If the unit lacks a sufficient charge, sulphur dioxide must be added immediately. In order to return oil properly to the compressor, it is necessary to maintain enough liquid refrigerant in the evaporator to float a blanket of oil at the level of the suction inlet opening, so that oil will be drawn back to the compressor. When the charge is low, the oil level in the crankcase falls below the reach of the eccentric and its rod, and burned-out bearings may result. The low charge causes an "oil logging" of the evaporator and an "oil starving" of the compressor.

Whenever there is any evidence of a low charge, this possibility must be checked at once and further charge added if required.

Adding SO_2 to the System

If the charge is found to be low, sulphur dioxide must be added to the unit as follows:

Run the unit, applying hot cloths to the sulphur dioxide cylinder if the cylinder is cold, to assist the transfer of sulphur dioxide into the unit. Close off the SO_2 cylinder valve at intervals and allow unit to "pull down" to approximately zero back pressure before adding more charge, if necessary. As soon as frost works back on the suction line from the evaporator under such operating conditions, sufficient charge has been added. When this condition is reached and with the back pressure at zero or less, close the suction valve to the SO_2 cylinder line by turning counter clockwise.

If unit has been allowed to operate for any appreciable time with a low charge, it is advisable to slightly overcharge it in order to insure the return of oil to the crankcase. After allowing the unit to run a sufficient length of time to permit the return of the oil, the unit must then be purged.

Open the shut-off valve on top of the compressor very slightly and purge sulphur dioxide from the unit until the frost level on the suction line returns to the interior of the cabinet.

Always check the oil level in the crankcase after a recharged unit has been in operation for several hours. Do not add oil in quantity to a unit which requires charging until after the charge has been added and

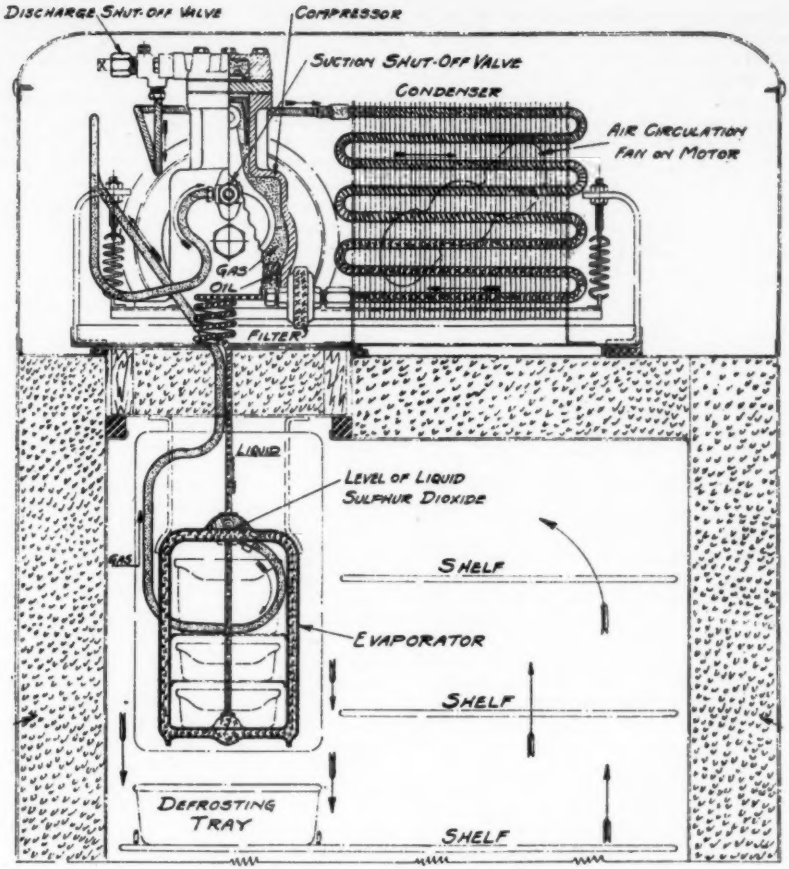

Fig. 2. Phantom view of the Crosley "Q" compressor and refrigerating system.

the unit allowed to run a sufficient time to insure the return of excess oil from the evaporator to the crankcase.

Removing SO_2 from the System

SO_2 is removed from the system only when it is necessary to disconnect the refrigeration system or where too much sulphur dioxide has been added in charging the unit.

Excess charge may be removed in the home with proper precaution. In all cases, however, where the unit is to be opened up or the evaporator or other parts disconnected, the entire unit should be removed to the shop and the operation performed there.

To pump the gas into an empty cylinder or drum, connect an empty cylinder to the compressor shut-off valve but do not tighten the coupling at the drum. Open the high side shut-off valve very slightly, (turn to right), until the odor of sulphur dioxide is noticed at the loose coupling, then tighten the coupling and open the cylinder valve.

Put the cylinder in a bucket of cold water, preferably ice water. Keep the cylinder as cold as possible until the operation is complete. A compound gauge attached to the suction shut-off valve will show when the charge has been removed completely. Start the unit and operate the compressor until the compound gauge reads 24 to 26 inches vacuum, with unit stopped, keeping the cyl-

inder cool in the meantime. When the gauge reads 24 to 26 inches vacuum close the cylinder head shut-off valve.

To discharge the unit through lye water, proceed as above except put the purge line in a bucket of water containing two gallons of water and two pounds of lye. Allow the gas to discharge slowly, starting the compressor only near the end of the discharge period. Close the discharge valve immediately before stopping the compressor after discharge is completed, so that lye water will not be sucked back into the compressor.

Drying Out the System

Before recharging a completely discharged unit, the entire system except the electrical components, (motor, temperature control, cable, etc.,) must be baked out in an oven under approximately 230 degrees F. of heat until it is thoroughly dry.

Effect of Air in the System

The effect of air in the system is to cause an abnormally high head pressure. To remove air from the system, proceed as follows:

Attach a pressure gauge to the high side shut-off valve. Open the valve slightly by turning right with the gauge loosely attached so that there is some leakage around the gauge coupling. Run the unit until the pressure gauge, when tightened up, registers the proper pressure for the room temperature.

Plugged Capillary Tube

A stoppage in the tubing, especially in the capillary tube, will cause excess liquid sulphur dioxide to collect in the condenser, resulting in excessive head pressure. This condition may be recognized by the fact that the frost level on the evaporator will be low, while at the same time the condenser will be cool. Start and stop the unit several times to see if the stoppage is temporary in character and may be cleared up. If the condition still remains a permanent stoppage is indicated, in which case the capillary tube must be replaced.

Replacing Capillary Tube

This operation should be performed in the shop after discharging the unit.

After changing the capillary tube the unit should be baked out thoroughly and recharged.

1932 units have the lower end of the capillary tube soldered into the evaporator. Should the tube break, a satisfactory field repair can be made by cutting off the old capillary tube several inches from where it enters the evaporator, and joining the end with a new capillary tube by means of a special capillary tube union assembly, part W14829. This consists of a union, with threaded openings at each end, into which capillary tube nuts, part 18301, are fitted.

The above method eliminates the necessity for removing the evaporator plug, when making repairs to the capillary tube on a 1932 unit.

Replacing Capillary Tube on 1939 Models

The capillary tube is soldered to the evaporator and filter connections with ordinary soft solder and may be removed with a heavy duty soldering iron or a torch. The capillary tube must be unsoldered from the suction line. Care must be taken when installing the new tube to see that the tube is clean where it is to be soldered and to prevent flowing too much solder into the connection which would possibly close the end of the tube. After cleaning the ends of the tube with sand paper or emery cloth and removing the pins from the ends of the tube, apply soldering acid and tin the tube at the point where the solder will eventually make the joint. Do not tin the tube all the way to the end as it would be practically impossible to install the tube and solder the connection without closing the ends with solder. Insert the tube 1½ inches into the evaporator fitting. Insert the tube as far as possible into the filter connection, then pull the tube back out ⅛ inch. The tube may then be soldered to both connections and clamped and soldered to the suction line in the same way the original tube was.

Adding Oil to the Compressor

Before checking the oil level, always check unit for proper charge and for possibility of there being excessive oil in the evaporator. Should there be excessive oil in the evaporator, it can be drawn back into the crankcase by proper charging.

The crankcase of the compressor should contain about 10 ozs. of Crosley refrigerator oil. The proper amount of oil is shipped in the unit and it should not be necessary to replace it unless some is lost in servicing. To check the oil level, proceed as follows:

Attach suction line compound gauge. Turn the suction shut-off valve about two-thirds closed but leave the discharge shut-off valve open. Operate the compressor in-

termittently until the compound gauge shows one pound pressure. Close the suction shut-off valve and stop the unit. Remove the plug on the corner of the crankcase and put a measuring rod down through the hole until it touches the bottom of the crankcase, (do not stand over compressor, as some condensed sulphur dioxide may be under oil). The oil level should not be less than one inch above the bottom of the crankcase as shown by the rod. If the oil level is lower than one inch, put in sufficient special Crosley refrigerator oil to fill the crankcase to a level of two inches. Replace the oil filler plug loosely; purge by opening suction shut-off valve and closing it as soon as a strong odor of sulphur dioxide is present, then tightening the oil plug securely. Open the suction valve, remove the gauge, and put the unit in operation. Purge if necessary.

Servicing Compressor Valves

First run the unit until the crankcase has warmed up. This will drive any refrigerant from the crankcase which might be condensed under the oil. Next close low side shut-off valve slowly and at the same time turn switch on temperature control to the "Off" position. Then listen to the evaporator; when all of the bubbling has stopped, turn the flywheel until the flat on the hub of the flywheel is at the top. Next close shut-off valve on head of compressor.

Remove head of compressor, leaving discharge valve with tubing attached to the head. Both reed and wafer valves are now accessible.

To service the piston valve, remove valve keeper using wrench 13021. Next remove wafer and lap valve seat with ½-inch round abrasive stone 17081, taking care to maintain a perfectly flat smooth surface. Replace wafer with a new one and reinstall valve keeper, re-peening it carefully. Clearance between wafer and keeper should be .006.

To service head valve, completely disassemble head valve plate. Lap plate on a lapping block and finish with a polishing operation, using ¾ inch square abrasive stone, 17080, taking care not to leave any scratches or grooves on the valve seat. Replace reed with a new one, taking care to have smooth side of reed down. One side of reed has a slight feather edge from the stamping operation, which can be felt and this side should be turned up.

Reassémble valve and replace valve in head using new gaskets, allowing head bolts to remain slightly loose. Purge compressor by cracking suction shut-off valve to crankcase, and closing after odor of SO_2 is noted. Tighten head bolts and open both suction and discharge shut-off valves, thereby placing unit in normal operation again.

Compressor Sticking

"Stuck-up" compressors are usually the result of moisture in the system or lack of lubrication.

These conditions arise through leaks or careless servicing. When you encounter a "stuck-up" compressor, remove the entire unit to the shop and go over it thoroughly to locate all possible leaks. Check especially for low side leaks.

Then close compressor shut-off valves, remove compressor and completely discharge the system. This may be accomplished by putting hot water in the ice-cube trays and heating the condenser.

After system is thoroughly discharged and leaks repaired, bake it out under vacuum. Install new replacement compressor and add proper charge.

Overcoming Oil Knocks, and Removing Excessive Oil

Oil knocks are usually caused by adding too much oil in servicing. It should never be necessary to add oil to the system unless there has been a leakage of oil. Low charge is sometimes improperly diagnosed as lack of oil. Always make sure that a low oil level is actually due to a lack of oil rather than to a low charge before adding oil.

Excessive oil may be removed by the following procedure:

Attach suction line compound gauge. Turn the suction shut-off valve about two-thirds closed, but leave the discharge shut-off valve open. Operate the compressor intermittently until the compound gauge shows one pound pressure. Close the suction shut-off valve and stop the unit.

Remove oil plug and insert oil purging tube, part 16719, screwing it down tight. Place a container under the outlet of this tube and crack suction shut-off valve slightly. This will permit the evaporator pressure to blow out any excessive oil. As soon as oil ceases to flow, the correct oil level has been reached, providing unit has the proper SO_2 charge, and the suction shut-off valve should then be immediately closed to the crankcase.

SERVICE CHART FOR CAPILLARY TUBE SYSTEMS

Effect Of On	Shortage Of SO_2	Plugged Capillary Tube	Air In System	Over-Charge Of SO_2	Leaky Head OR Piston Valve	Loose Control Bulb	Discharged Control Bulb	Seal Leak
Refrigeration	Poor	None	Normal Unless Head Pressure Is Very High	Poor	Normal Poor If Too Bad	Too Cold	——	Depends On Head Pressure
Head Pressure	Low	Very High	High	High	Low	——	——	High Due To Air
Back Pressure	Low	High	Normal Unless Head Pressure Is Very High	High	High	——	——	Depends On Head Pressure
Suction Line	Warm	Warm	Warm	Frosted	Warm	——	——	Warm
Vibration	Normal	Bad	Depends On Head Pressure	Depends On Head Pressure	Normal	Normal	——	Depends On Head Pressure
Temperature of Condenser	Normal	Cool	Hot	Hot	Normal	——	——	Hot
Cycle	Probably Continuous	Thermal Relay Kicks Out	Runs Too Long	Runs Too Long	Runs Too Long	Continuous Or Runs Too Long	Will Not Start	Runs Too Long
Wattage	Low	Very High	High	High	Low	Normal	——	High

Example: The effect of an overcharge of SO_2 on the suction line is a frosted condition of the line.

Changing Compressor Body

If possible, have the unit in operation so as to have a minimum amount of SO_2 in solution with the oil.

Then turn suction shut-off valve all the way in to right, and as soon as valve stem seats, throw switch stopping unit. Next turn head shut-off valve all the way to right until valve stem seats firmly. Now turn suc-

tion shut-off valve to left slightly until compound gauge reads zero to one pound pressure, when again turn to right until seated firmly.

Remove belt from flywheel. Take out the four bolts holding compressor body to metal base. Now by removing the hexagon cap screws which hold the head shut-off valve and suction shut-off valves, the compressor body can be lifted from metal base. Remove flywheel from compressor body assembly.

Check oil in compressor body just removed and by adding or removing have the same amount in the replacement compressor body. (If you find a shortage of oil in the compressor body just removed, it is an indication of shortage of SO_2 in the refrigerator system, in which case it is necessary to add SO_2 until the oil is returned to the proper level in the crankcase of compressor body.)

Compressor Seal and Shaft Repairs

Shut off unit, turn flywheel until the flat of the hub of the flywheel is at the top and let compressor stand in this position for 15 or 20 minutes to permit pressure to equalize. Close both shut-off valves tight against compressor by turning as far as possible to right. Loosen cylinder head bolts slightly until a faint odor of SO_2 can be detected. Permit to stand about five minutes, then loosen cylinder bolts further, (do this slowly to make sure all SO_2 has evaporated before removing cylinder head bolts completely).

As soon as all SO_2 has been released from compressor body, remove cylinder head bolts completely. Tap cylinder head slightly to loosen. The cylinder head remains attached to shut-off valve. Now remove the two ¼ inch cap screws that hold low side shut-off valve to crankcase. Remove belts from compressor pulley and by removing the four hold-down bolts in base of compressor, it may be removed from sub-base assembly.

Remove flywheel from shaft and remove oil plug and drain out oil. Clamp compressor to work bench with the large hex nut to the front of the bench, and use a large wrench or socket to remove this plug. This releases the tension on the spring and ball thrust. Both spring and ball can be removed as soon as the plug has been removed. Reverse the position of compressor, remove the five cap screws in the retainer plate over drive end of shaft, and the whole seal assembly may be removed from compressor.

Remove base from compressor and turn eccentric until eccentric set screw is accessible. Loosen lock nut and remove set screw. Rotate crankshaft so as to line up key in shaft with slot in bearing. Pull shaft straight out being careful not to cock or spring connecting rod.

In repairing a seal leak it is absolutely necessary that the seal shoulder of the shaft be resurfaced square and free of grooves to a highly polished finish. This shop operation is done as follows:

Equip the service shop with two lapping blocks, two shaft chucks, (.750 inch size) and (.765 inch size), two lapping tools, polishing compound, abrasive compound and a seal centering tool. Also a stock of lead gaskets, cork washers, and seal diaphragm assemblies should be carried for replacement.

An electric motor (½ inch diameter shaft) should be securely bolted to the work bench.

Insert the compressor crankshaft in the correct size chuck. Fix the chuck to the motor shaft by means of the Allen set screw in the chuck.

Thus with the shaft revolving, it can be readily lapped in just a few minutes time, providing the following procedure of lapping is carefully carried out.

First of all, the lapping blocks and tools must be kept in good working condition. The blocks must not have any rough or hollow spots, therefore they must be lapped together frequently, first with the abrasive compound, and then finished with the polishing compound. This keeps the blocks perfectly flat and smooth and enables you to keep the lapping tools in good condition for the shaft operation.

Lapping Shaft

In lapping the shaft, both lapping tools should be used, keeping them separated for the coarse lap and the polishing lap. Use 43869 abrasive compound with a light grade of oil, (refrigeration oil), for the coarse lap, keeping that lapping tool and block segregated, and then use the 40129 compound with the other tool and block for the polishing operation. Lap the tool over the entire block in a figure-eight motion with the coarse compound, and then place this tool on the shaft, bearing it against the seal shoulder firmly and holding it rigidly to prevent it from rocking or chattering. Continue this operation, repeatedly lapping the tool on the block in order to prevent it from grooving, as the soft tool will wear faster than the hard shoulder of the shaft. When the rings

or grooves are surfaced out of the seal shoulder, a similar polishing operation with the finishing lapping tool and compound can be applied, and the seal shoulder should surface out to a mirror-like finish or in the same condition as a new shaft.

The use of No. 320-A "Speed-Wet" or No. 400 Trimite abrasive paper is satisfactory for keeping the lapping tools in perfect condition. Place the abrasive paper on the lapping block and move the tool carefully over the paper until a square bright surface is accomplished. Always follow up this operation with a 40129 compound lap on that respective lapping block. Occasionally the lapping tools should be chucked in a lathe and a thin true-up cut taken off so that they will always be in perfect shape.

The case hardening of the shaft seal shoulder is .015 inch. So if the groove in the shoulder is deeper than .005 inch, it is not advisable to lap that shaft because of the probability of lapping beyond the case hardened depth of the shoulder.

The seal ring of the seal diaphragm assembly can be resurfaced on the lapping block using the polishing compound, but it is recommended that a new seal diaphragm be used rather than resurface the old one.

When both the shaft and seal diaphragms are properly cleaned with carbon tetrachloride or cleaning fluid, they can be replaced on compressor.

After the shaft and inner parts have been assembled in the crankcase, the seal diaphragm assembly can be placed on the shaft. All parts of the seal assembly are placed on the seal centering tool as follows:

1, Seal Cover; 2, Cork Washer, (always use new cork washer); 3, .010 inch seal gasket; 4, seal diaphragm; 5, .020 inch seal gasket.

Be sure there is no dirt inside the centering tool or on the shaft and assemble the seal cleanly with only a coating of refrigeration oil on its surface. After the seal assembly has been centered in place and the seal cover tightened, the thrust spring assembly and plug can be inserted in the opposite end of the crankcase. Then the centering tool can be removed and the base plate installed.

Replacement of Internal Moving Parts of Compressor

It is not recommended that dealers or distributors attempt to replace internal moving parts of the "Q" compressor with the exception of wrist pins and shafts, unless the service man has had considerable experience and factory instruction. There are eleven sizes of wrist pins ranging from No. 0 to No. 10. When fitting a new wrist pin to a connecting rod a pin should be selected which will not drop out of the connecting rod when turned so the pin is in a vertical position and still not so tight but what it can be worked freely with the fingers. A special tool, No. 17036, for removing and inserting wrist pins is available.

There are six sizes of shafts ranging as follows: .750 No. 1, .750 No. 2, .750 No. 3, .765 No. 1, .765 No. 2, .765 No. 3. The first three sizes are for standard size replacement while the latter three sizes are for oversize replacement. When replacing a shaft a new shaft must be selected which fits the compressor bearings properly. They must be fit to the extent that it is impossible to notice any shake in the shaft when examination is made. If a shaft is installed which is too loose the shaft seal will leak gas and the shaft will probably knock when the compressor is in operation. If a shaft is selected which has to be forced into the bearings it will probably "freeze" when the compressor is put into operation. A seal centering tool No. 13022 is a necessity when reassembling a compressor to insure concentricity of the seal ring with the seal face on the shaft.

Replacement Pistons

Pistons are graded in six size numbers from one to six inclusive. No. 1, 2, and 3 are for standard size replacement while No. 4, 5, and 6 are for oversize replacement. Pistons must be selected which fit the cylinder properly to insure high efficiency.

Eccentrics are graded as to standard, No. 12198 and oversize, No. 19608. The standard eccentric fits the three standard sizes of shafts while the oversize fits the three oversize shafts. It will be necessary to select a connecting rod to fit the outside diameter of the eccentric or to lap the two parts to a fit.

An assembly No. MG33-18292 consists of a standard size eccentric with a connecting rod fitted to the eccentric. Assembly No. MG34-18292 is the same as MG33-18292 except that the eccentric is for oversize shafts.

Another assembly No. 12856 consists of a piston, standard eccentric, and connecting rod all fitted. Assembly MG35-18292 is the same as No. 12856 except that the eccentric is for oversize shafts. When installing this assembly it may be necessary to change the piston in order to have a perfect fitting piston.

Second Article

Thermostatically Controlled Expansion Valves

By A. F. HOESEL*

AS shown in Fig. 1 (August issue), most thermostatically controlled expansion valves give increasing superheat with decreasing refrigerant temperature, and vice versa.

Now, most readers are acquainted with the fact that many valve manufacturers recommend using, for equivalent heat loads in B.t.u. per hour, a larger orificed size valve, or at least a valve with a special diaphragm spring having a low build-up rate, on low temperature jobs. The reason therefor may not be obvious, so the following explanation will be in order.

Fig. 2 shows, diagrammatically, the forces tending to operate a thermal valve. For purpose of simplicity it is assumed that the diaphragm has an effective area of one square inch. The operation would be exactly similar if the diaphragm were replaced by a bellows having an equivalent effective area of one square inch.

We shall assume that the valve is adjusted to maintain a 10 degree F. superheat with a 20 degree refrigerant temperature in the coil, and that both the refrigerant and the thermal charge are methyl chloride.

As you can note, the thermostatic charge pressure is 20.98 lbs., and the coil pressure plus the spring pressure (14.46 lbs. plus 6.52 lbs.) equals 20.98 lbs. total. The valve is now in equilibrium and we shall suppose it to be opened, say, .020 inch, off its seat, which will give its rated capacity at these conditions.

Supposing we take this same valve and put it on a system having a refrigerant temperature in the coil of minus six degree F., what happens?

Fig. 3 graphically shows the changed conditions. In this case the refrigerant pressure in the coil plus the spring pressure (1.75 lbs. plus 6.52 lbs.) equals 8.17 lbs. total, and the thermostatic fluid pressure of 8.17 lbs. necessary to open the valve can occur only when the temperature feeler bulb reaches 9 degrees F., during which the valve is operating to maintain a 15 degrees F. superheat instead of the 10 degrees F. superheat previously.

In order to make this valve maintain a 10 degrees F. superheat with a minus six degrees F. refrigerant in the coil, we must adjust the spring as shown in Fig. 4.

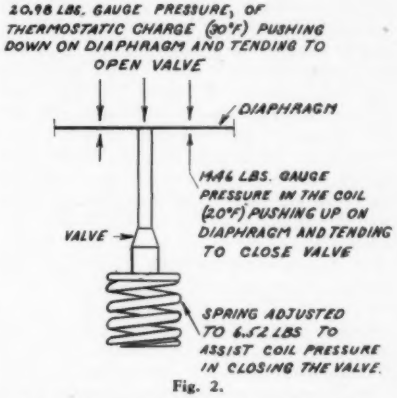
20.98 LBS. GAUGE PRESSURE, OF THERMOSTATIC CHARGE (30°F) PUSHING DOWN ON DIAPHRAGM AND TENDING TO OPEN VALVE
DIAPHRAGM
14.46 LBS. GAUGE PRESSURE IN THE COIL (20°F) PUSHING UP ON DIAPHRAGM AND TENDING TO CLOSE VALVE
VALVE
SPRING ADJUSTED TO 6.52 LBS TO ASSIST COIL PRESSURE IN CLOSING THE VALVE.

Fig. 2.

I previously stated that the valve in Fig. 2 was opened .020 inch. Will the valve in Fig. 4 be opened the same amount? If it is not opened the same amount, it is obvious that the valve cannot pass the same amount of refrigerant and therefore its capacity must be reduced.

We shall assume that between its .020 inch opening, in Fig. 2, at 10 degrees F. superheat, and its closed position, it will take a three degrees F. superheat change. The valve would then just start to open at 7 degrees F. superheat and be fully opened at 10 degrees F. superheat. How much will the valve in Fig. 4 be opened at 10 degrees F. superheat?

* Flow Controls, Inc., Chicago.

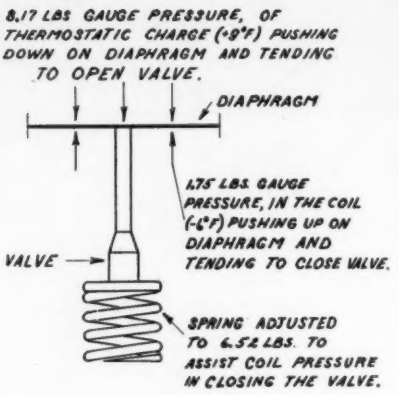
8.17 LBS GAUGE PRESSURE, OF THERMOSTATIC CHARGE (+9°F) PUSHING DOWN ON DIAPHRAGM AND TENDING TO OPEN VALVE.
DIAPHRAGM
1.75 LBS. GAUGE PRESSURE, IN THE COIL (-6°F) PUSHING UP ON DIAPHRAGM AND TENDING TO CLOSE VALVE.
VALVE
SPRING ADJUSTED TO 6.52 LBS. TO ASSIST COIL PRESSURE IN CLOSING THE VALVE.

Fig. 3.

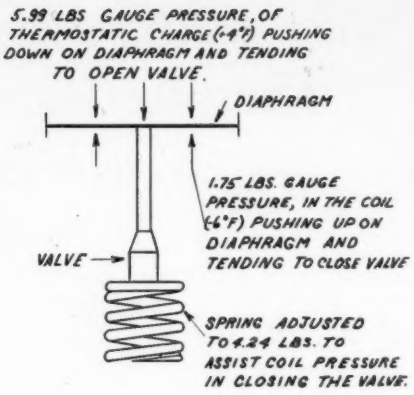
5.99 LBS GAUGE PRESSURE, OF THERMOSTATIC CHARGE (+4°F) PUSHING DOWN ON DIAPHRAGM AND TENDING TO OPEN VALVE.
DIAPHRAGM
1.75 LBS. GAUGE PRESSURE, IN THE COIL (-6°F) PUSHING UP ON DIAPHRAGM AND TENDING TO CLOSE VALVE
VALVE
SPRING ADJUSTED TO 4.24 LBS. TO ASSIST COIL PRESSURE IN CLOSING THE VALVE.

Fig. 4.

Consulting the thermodynamic tables for methyl chloride, we note that between 27 degrees F. and 30 degrees F., the thermostatic charge has a pressure variation of .675 pounds per degree F. Therefore, since the valve operates on a three degree F. superheat differential, between closed and wide open, we find that the spring must be compressed .020 inch when subjected to .675 lbs. x 3 degrees F. = 2.03 lbs.

Further consulting the thermodynamic tables, we note that between one degree F. and four degrees F., the thermostatic charge has a pressure variation of .454 pounds per degree F. Now, how wide will the valve in Fig. 4 open when the spring is adjusted to apparently maintain a 10 degree F. superheat? Its degree of opening will be inversely proportionate to the ratio of the thermostatic charge pressure variations (.020 x .454) ÷ .675 = .013 inches.

It is readily seen that the valve in Fig. 4 is only two-thirds opened as compared to the valve in Fig. 2. Obviously, it cannot pass the same amount of refrigerant. What to do? For one thing, we can use a larger sized valve and orifice, since with a reduced opening we can then still get the same flow. Supposing we do not want to use a larger valve and orifice, we could resort to using a spring having a lower build-up rate. In fact, its rate would then have to be 2.03 x .66 = 1.34 lbs. for .020 inch movement.

From the above it can be readily seen why such thermal valves are rated for different capacities at different refrigerant temperatures, and why, in some cases, thermal valves to be used for low refrigerant temperatures are equipped with special so-called soft springs.

The natural conclusion would be that all valves should be equipped with springs having characteristics of low build-up rate and sufficient compression adjustment thereto so that they could still be used on the higher refrigerant temperatures. In theory this is possible however, in such a case thermal valves would then be of greatly enlarged dimensions as compared to the dimensions of present day thermal valves.

There are certain other design means which overcome reduced capacity at low refrigerant temperatures, and these will be discussed in future articles.

(To be continued)

Louis H. Abeler
Illinois

In some manner I lost the August issue of your magazine, Refrigeration Service Engineer.

May I ask that you send me another issue? These magazines I find are as indispensable and as necessary to a service man as are the tools he works with.

Harold R. Godbeer
Canada

Enclosed please find $3 for next year's subscription to The Refrigeration Service Engineer. I would not want to miss it for anything, it has been very helpful to me. I greatly enjoy and have derived a great deal of benefit from the Q. & A. Dept. and the Service Kinks.

The Problem of Dryers and Drying Agents

By KENNETH M. NEWCUM*

DRYERS and drying agents and problems pertaining thereto are probably the most discussed items in the refrigeration service business because moisture and its attendant evils have undoubtedly caused the refrigeration industry more unnecessary service expense, equipment failure, parts replacement, and general dissatisfaction than any other contributing factor.

It is not uncommon to hear service engineers contend that a certain make of expansion valve is absolutely worthless, shouting to the high heavens that they will never use that particular make again because it sticks shut and is generally no good; or to comment that moisture causes no harm in methyl chloride and Freon-12 systems except perhaps freezing up in the expansion valve needle and seat; or that they dry sulphur dioxide jobs in the same manner as they dry methyl chloride and Freon-12 jobs; or that moisture problems are a thing of the past for they simply put in a "shot" of nonfreezing solution and their problems are over.

These are merely a few of the opinions that service engineers are apt to have and it shall be the purpose of this paper to bring these several subjects to the front and discuss them with a view to arriving at a simple solution to many of the problems.

In the first place, it is reasonable to assume that a considerable amount of the moisture present in refrigeration systems enters at the time of installation. I believe we can be perfectly safe in saying that the manufacturers of condensing units, low side equipment, and other installation equipment take great pains in removing all traces of moisture from the equipment prior to charging with dry refrigerant and oil so that when the equipment is received on the job it is devoid of moisture. The copper tube is dehydrated and sealed, the expansion valves, line valves, and fittings are well protected, so that, if moisture enters at the time of installation, it must be allowed to do so by the installation engineer, for during the process of installation the tubing is cut open, the coils are unplugged, and they obviously fill with air; and it is common knowledge that all air contains moisture. Hence moisture can be said to be present in the inside of all of the tubing and refrigerant circuits at the time the installation is completed.

There are several common methods now employed for the removal of this trapped air, some of which remove a portion of the air and leave the moisture behind while others are quite efficient. They are as follows: (1) purging through an open suction line by means of refrigerant pressure from the liquid receiver; (2) evacuating with the refrigeration compressor; (3) heating the tubing lines and coils with either one or both ends of the lines open; (4) circulating air through a dryer, thence through the tubing and coil circuits, and then evacuating; (5) evacuating with a highly efficient vacuum pump which pulls a vacuum of approximately 29.67 inches of mercury.

Comparison of Methods

The relative ability of the above methods to remove air and moisture is as follows:

(1) Purging may be said to be successful if the circuit is composed only of one continuous tube coil where there is no danger of an air trap or pocket. However, if it is a multiple system or if the evaporator is manifolded, there will undoubtedly be air traps. Also, moisture which may be condensed out on the inside surfaces of the tubing is not easily removed in this manner.

(2) Method two, evacuating with the refrigeration compressor, is a doubtful method for the reason that the average refrigeration compressor can pull a vacuum of only approximately 25 or 26 inches of mercury and at this pressure the boiling point of water is somewhere in the neighborhood of 110 degrees to 135 degrees. Hence the air will be removed but moisture that may have con-

* Sales Manager, Superior Valve and Fittings Co. Paper presented before the 1st annual Convention sponsored by the Ontario Maple Leaf Chapter R.S.E.S. April 1, 1940.

densed out will remain in the tubing and evaporator circuit.

(3) The next method is heating the lines. Heating of the water in one part of the circuit will cause the moisture to turn to steam or vapor and it will probably travel to another unheated portion of the circuit and recondense. Hence heating alone is not considered a good method of removing the moisture.

(4) Circulating dry air and heating may be considered a successful method providing, of course, that the air after passing through the dryer is thoroughly dried and that the tubing circuit is heated progressively from the dryer circuit through every tube of the evaporator and out to the end of the suction line. With this method the water vapor is picked up in the dry air circuit and exhausted out the end of the line. Following the drying process a vacuum should be created to remove the remaining dry air.

(5) The vacuum pump method has been found to be entirely successful for at 29.67 inches of mercury the boiling point of water is reduced approximately to 40 degrees F. Hence the vacuum alone will reduce the water to vapor and remove it even without heat, providing of course the room temperature is normal.

Install Permanent Dryer

Realizing the pitfalls of leaving moisture in the system at the time the installation is made, it should behoove us to employ the best possible method of removing all traces of air and *moisture* at the time a new installation is made as a low-cost insurance against future service troubles; for a job that starts out perfectly dry is more apt to give years of successful service. Even though one of the better methods is employed for removing air and moisture, it is considered good policy to install at time of installation a permanent dryer-filter filled with a drying agent which will not break down, as protection against moisture which might enter the system as a result of subsequent servicing.

The problem of removing moisture from an old sulphur dioxide job is perhaps more difficult than the other refrigerants for the reason that when moisture enters a sulphur system the moisture unites with the sulphur oxide to form a solution of sulphurous acid. Hence there is little if any free moisture to be removed by drying agents. The most effective way of removing moisture from a sulphur job is to dump all of the refrigerant and oil from the system. The refrigerant should be dumped as a liquid, not as a gas, for if the refrigerant is removed as a gas it will simply boil off and leave the moisture and other foreign matter in the system. Whereas, dumping as a liquid removes the moisture which is in solution with the refrigerant. The system should then be recharged with new refrigerant and new oil and allowed to operate for a short period, following which a sample of the *liquid* refrigerant should be drawn into a clean dry glass vessel in which is placed a clean dry polished steel disc. The liquid will boil off. If after boiling off the polished steel disc retains its polished appearance, the system may be said to be dry. However, if the disc is discolored, the system obviously contains sulphurous acid and the charge should again be dumped and the above process repeated. There is no objection to installing a dryer either in the liquid or suction line of an SO_2 system. However, the manufacturers of SO_2 advance the theory that drying of SO_2 with ordinary dryers is not entirely successful.

Moisture in Methyl

When moisture is noticed in a methyl chloride system which has been in operation for some time, the first procedure is to install a good, large-capacity dryer-filter. If this reduces the moisture content to a point where the job operates successfully, then the problem is at least temporarily solved. However, if the job contains a large amount of moisture, the refrigerant should be dumped in the same manner as sulphur dioxide and recharged with new refrigerant. It is often considered good practice to clean the inside of the tubes with carbon tetrachloride prior to recharging. The cleaning should be followed by one of the accepted drying methods previously discussed before the system is put into operation. After recharging, a new dryer-filter should be installed in the liquid lines.

Moisture and methyl chloride and the heat of the compression will result in a hydrochloric acid solution, the strength of the solution depending upon the amount of moisture, the degree of heat, and the amount of time the moisture has been present in the system. Hydrochloric acid causes the oil to break down, copper plating, and often will cause the compressor to stick tight. Some authorities on dryers and drying agents have data showing that the better drying agents reduce the acid content to a point where it will cause no appreciable damage. How-

ever, it is the author's personal opinion that, if the system contains a large amount of moisture, it obviously contains a large amount of acid and it is a good deal better to dump the acid-laden refrigerant and oil and start out over again rather than to depend upon a dryer to remove a large amount of acid, which it may or may not do depending on several intangibles. The effect of methyl alcohol in a methyl chloride system does not to any great extent affect the acid condition. The purpose of the alcohol or other non-freezing solutions is obviously to raise the freezing point of the water present in the refrigerant, preventing freezing of the moisture at the expansion valve needle and seat. Many competent refrigeration engineers have used non-freezing solution with, according to their statements, a fair degree of success. However, the fact still remains that if there is moisture present there is also acid, and it seems reasonable to expect that the system would be better off if the acid were removed by dumping. At this point it might be well to mention that we are in favor of using permanent dryers, providing they are charged with the proper amount and type of drying agent, for the reason that moisture may enter a system at any time under certain conditions and if a dryer is present it will remove the moisture from the refrigerant stream before it has had time to create an acid condition.

Moisture in Freon

Many refrigeration service engineers have the erroneous opinion that aside from freezing out at the expansion valve needle and seat moisture causes no harm in Freon-12 jobs. Moisture and Freon-12 and heat result in a solution of hydrofluoric acid which is known to attack expansion valve needles and seats as well as compressor valves. Hence all precautions should be taken to keep moisture out of Freon-12 the same as with methyl-chloride and sulphur dioxide. If a Freon-12 job contains only a slight amount of moisture, then one of the better dryer-filters should reduce the moisture and perhaps the acid content to an unharmful degree. However, if the job contains a large amount of moisture which has been present for some time and which has given considerable service difficulty, the Freon-12 should be dumped the same as methyl chloride and sulphur dioxide. Hydrofluoric acid has a tendency to weaken the grain structure of the Swedish steel compressor valves and often is the cause of frequent suction and discharge breakage which may not be attributable to more tangible causes.

Summarizing the available drying agents may be done as follows: Calcium chloride is an absorbing agent which, because it breaks down into brine when saturated, should be used only for temporary work and then should be used only by experienced refrigeration men. Calcium oxide is an absorbing agent which is recommended for temporary drying for the reason that it breaks down into a powder when saturated with moisture. This powder is very fine and may penetrate inefficient filters and be carried through the system. Drierite (calcium sulphate) is basically adsorbing. However, it has a tendency to soften slightly when wet but not to the extent that it breaks down into a powder or a brine. It therefore may be used for permanent dryers. Activating Alumina (aluminum oxide) is an adsorbing agent which is entirely suitable for permanent drying. Silica Gel is an adsorbing agent, it being a manufactured material obtained by the reaction of a mixture of soluble silicate such as water glass and sulphuric acid. The silicic acid formed by the reaction sets into a jelly-like mass following which it is washed free of excess acids and salts. After washing it is dried, sized, and heat-treated and has the appearance of a hard glassy material much like clear quartz granules. Dry-X is an adsorbing material which may successfully be used for permanent drying.

In summarizing the use of dryers, the following points should be observed: (1) The general application is in the liquid refrigerant line. (2) Dryers should be installed vertically instead of horizontally so that the drying agent packs into the dryer to prevent by-passing. (3) The dryer should be equipped with a highly efficient filtering arrangement at the outlet end to prevent powder from leaving the dryer and going into the refrigerant circuit. (4) A permanent dryer should be left in every installation. (5) Don't gamble with used drying agents. Often more moisture is put into a refrigeration system than removed by the careless use of used drying agents. (6) By all means use a dryer that has a sufficient capacity for the job. (7) Don't expect too much of a dryer. Their primary job is to absorb or adsorb free moisture. (8) If the job contains acid, dump the refrigerant and oil and recharge with new, clean refrigerant and oil and then install a good permanent dryer-filter for future protection.

High Side Float Service*

THE unnecessary expense involved where a float assembly is changed only to find that the trouble was elsewhere, is a financial loss to all concerned, and of considerable inconvenience to the customer. It is, therefore, felt that any constructive suggestion that will help arrive at the proper analysis of conditions involving the float will be welcomed.

Function of the Float

The function of the high side float is to regulate the flow of liquid refrigerant from the high side to the low side of the system. Any movement of the float ball and needle must be accomplished by a change in the liquid level in the float chamber. As the compressor pumps refrigerant vapor into the condenser, the vapor condenses into a liquid and then the liquid flows into the float chamber. When the liquid enters the float chamber and raises the level slightly, the float ball raises with the rise in liquid level and opens the needle valve sufficiently to establish a rate of flow from the chamber into the vaporizing coil equal to the rate of flow from the condenser. Thus the movement of the float is dependent upon any change in the capacity of the compressor which results in a change in the rate of liquid flow from the condenser into the float chamber.

The capacity of the compressor for a given room or condensing temperature is largely dependent upon the suction pressure in the vaporizing coil or cooling unit. For a fixed amount of surface in the vaporizing coil or cooling unit and a fixed temperature surrounding this surface when the compressor is running, the suction pressure is dependent upon the amount of the surface in the vaporizing coil or cooling unit that is wet with liquid refrigerant. In a high side float system the amount of surface wet with liquid refrigerant is entirely dependent upon the refrigerant charge. Therefore the maximum travel of the float is at the beginning of the cycle, and then only when the vaporizing coil is fully charged with refrigerant with its resulting maximum suction pressure for a given cabinet temperature.

Thus the refrigerant charge is the predominating factor in obtaining normal movement and operation of the high side float. For this reason our discussion will deal with the effects and results of varying the refrigerant charge and how to determine the minimum and maximum charge for a high float system with a heat exchanger coil in the float chamber for liquid sub-cooling Freon 12 refrigerant.

The refrigerant charge is correct when all the cooling unit surface is wet with refrigerant, with some liquid spilling over into the accumulator or suction header of the cooling unit when the temperature of the cooling unit is near the minimum cut-out temperature.

Before describing how to check for correct charge or how to add sufficient charge for the maximum operating condition, it is well to consider some of the characteristics of Freon-12 and the possible effects of other liquids that may enter the vaporizing coil and temporarily change the liquid level in the float.

False Indications of Charge

Freon-12 vapor is heavy compared to the vapors of other common refrigerants. At 12 lbs. suction pressure it is 2.5 times heavier per unit volume than methyl chloride and two times as heavy as sulphur dioxide. For this reason the service man may be easily misled in the quantity handled in adding vapor to a system or purging.

When the compressor cuts in, there is a sudden drop in the pressure in the cooling coil. This results in violent boiling of the liquid in the coil. The principal function of the accumulator is to catch the drops of liquid refrigerant that are carried out of the coil during this period of violent initial boiling and permit them to be vaporized before passing into the heat exchanger.

The apparent volume of refrigerant in the cooling coils may be increased by either the passing of oil from the compressor, or the addition of a drying fluid. In either case suf-

* Courtesy of the Kelvinator Division, Nash-Kelvinator Corp.

ficient operating time should be allowed for the return of the oil or the normal distribution of the drying fluid before checking the charge in the system.

There is a definite moisture content allowable in all refrigerants. With Freon-12 in a given system the moisture content must be below that which will freeze out at the minimum suction temperature normally encountered for a given application. Lower than normal refrigerant charge means lower than normal suction pressures and temperatures at the inlet to the cooling unit. This abnormal low temperature will reduce the solubility of moisture with the Freon. This reduced quantity of Freon-12, together with the reduced solubility of moisture in the Freon, can create a condition favoring the separation of moisture in the form of ice at the inlet to the coil. This can partially or completely restrict the flow of the refrigerant. With normal refrigerant charge and suction temperature, the existing concentration could not freeze out. Analysis of the preceding statements indicates the necessity of the correct refrigerant charge to eliminate the symptoms of inoperative floats and freeze ups.

With reference to oil entering the float and cooling unit to upset the balance of the system, it is well to remember that oil slugging can only happen when there is a sudden reduction of pressure in the crankcase. A rapid reduction in the crankcase can happen only by deliberately closing the suction service valve or having practically no refrigerant in the cooling unit. The procedure for adding and checking for the correct refrigerant charge in ice cream cabinets using Freon-12 with high side float liquid control is outlined jn the following paragraphs.

Adding Refrigerant

Never attempt to pour or force liquid refrigerant into the high pressure or low pressure side of the system. Always connect refrigerant cylinder with the valve end in a vertically upward position to the suction side so that vapor only will be drawn in to the compressor and condensed in the condenser. To expedite adding refrigerant, the cylinder pressure should always be kept at least 20 lbs. higher than the pressure in the low side so that when the cylinder valve is opened each time during the process of charging, refrigerant vapor will rapidly enter the system thus preventing the compressor from taking part of the vapor from the cooling unit and part from the cylinder. This can be accomplished by placing the cylinder in a pail of warm water.

Connect the refrigerant cylinder to the gauge opening in the suction service valve with ¼ inch tubing. An accurate compound gauge must be installed to read the pressure in the connecting tubing. Leave flare nut loose at suction valve and thoroughly purge air from connecting tube and gauge by slightly opening cylinder valve.

Tighten flare nut, open cylinder valve, note gauge pressure, then close cylinder valve. If the gauge reading drops, the connecting tube leaks. If the reading does not drop, the tubing is reasonably tight for this service operation. After you have ascertained that the gauge line is tight, turn suction service valve stem for gauge reading on the low pressure side of the system. Install high pressure gauge in opening in discharge service valve. Permit compressor to operate and carefully observe the compound gauge reading and high pressure reading. If the compound gauge reading indicates lower than normal suction pressure for the prevailing cabinet temperature, or you wish to ascertain if sufficient refrigerant is in the system for maximum conditions, proceed as follows:

Checking the Refrigerant Charge

Turn in suction service valve two turns, open cylinder valve admitting a small quantity of refrigerant vapor, and then close cylinder and adjust suction valve stem again for accurate gauge reading. Observe compound gauge reading and if by adding this small amount of vapor the pressure increases slightly, this is evidence that the surface in the cooling unit is not all covered with liquid and by adding this small quantity some additional cooling surface was wetted, thus raising the suction pressure. As an example, let's assume a cabinet sleeve temperature of 25 degrees F. and a compound gauge reading of three lbs. pressure. This would indicate that the cooling unit was starved of refrigerant for some reason. If by adding a slight amount as just described we raise the suction pressure to five lbs., this certainly indicates a shortage of refrigerant. We repeat the above operation, adding a slight quantity of refrigerant each time until we reach a point where the suction pressure fails to increase above the preceding operation. We have then added sufficient refrigerant to wet all the surface in the cooling unit and spill over in the accumulator.

Let's assume that in the preceding example

we had repeatedly added a slight quantity each time until the suction pressure reached 12 lbs. and then failed to rise on the next one or two openings of the cylinder valve. We would then have a minimum charge of refrigerant. However, if the unit had been this short of refrigerant, a part of the oil in the crankcase would be over in the cooling unit. We should then let the system operate 15 or 20 minutes before making the last test in order for the oil to return to the crankcase. Now let's assume that we continue to add refrigerant after the liquid spills over into the accumulator. We would soon reach a point where the accumulator would become full and drops of liquid would be drawn into the heat exchanger coil in the top of the float chamber. At this point the high pressure gauge reading would drop off; the amount depending upon how much liquid entered the heat exchanger coil, and the compound gauge will drift over a two lb. to four lb. range, again depending upon how much liquid entered the heat exchanger coil. At this point the system is overcharged and will operate inefficiently and may even spill over sufficiently to slug oil and thus appear as a stuck open float. Should this condition of overcharge occur, it will be necessary to purge out three or four ounces of refrigerant to move the liquid level back into the accumulator, which will be indicated by the head pressure gauge rising back to normal and the suction gauge becoming stable.

Repeated tests in the shop and the field prove that with the refrigerant level established not more than half way in the accumulator, which is the maximum refrigerant charge, that a float leaking sufficiently to balance the high pressure and low pressure gauges on each off cycle *will not interfere* with the normal refrigeration of the cabinet.

SERVICE KINKS

Tools and Equipment You Can Build

Under this heading will appear simplified or short cut methods of performing individual service operations; also details of how you can build special tools and equipment for your own use. Readers are invited to submit information for publication under this head.

Overcoming "Water Hammer"

By R. H. BAINBRIDGE
Glens Falls, N. Y.

I HAVE recently found an answer to "water hammer" caused by the water valves on small condensing units. A customer of ours complained of banging and knocking of water pipes all through his building, causing a few leaky joints and finally a broken water jacket in his one-horsepower water-cooled unit.

The idea used to correct the trouble may be an old one to some men, but it is entirely original with us.

Fig. 1 explains the method, which is very simple and does a beautiful job. The water flow through the unit modulates from full flow to the off position without a murmur. Previously, it banged and shuddered as though the building was coming down.

The tank shown in Fig. 1 is a small domestic liquid receiver installed upside down. A half-inch tee was inserted in the outlet to which we connected the half-inch water line to the water valve. Using a receiver was cheaper and more convenient than making a tank out of three-inch pipe when we considered the labor of threading the pipe, drilling the caps, etc. The receiver also makes a neater looking job.

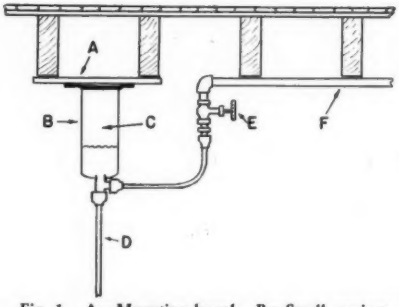

Fig. 1. A—Mounting board. B—Small receiver. C—Air cushion. D—½-inch line to water valve. E—Shut-off valve. F—City water line.

The Question Box

Readers are invited to send their problems pertaining to the servicing of household refrigerators and small commercial refrigerating equipment as well as oil burners to "The Question Box."

CALCULATIONS DO NOT AGREE

QUESTION 388: I have before me under the title, "Calculations for a Dairy Farm," something that is a little confusing to me. The writer of that article, in order to calculate the evaporating surface for a brine tank, took as basis of heat transfer for 1¼ inch pipe, 5.65 B.t.u. per hour per lineal foot per degree temperature difference for still brine, and assumed 7 degrees as the difference in temperature between the evaporating temperature and the brine temperature.

I have a formula taken from the "Commercial Refrigeration Book," published by Nickerson and Collins Company, for calculating coilage, as follows:

$$L = \frac{\text{B.t.u. per hour operation}}{K \times (Tr - Tp)}$$

L = lin. ft. of pipe per sq. ft. of surface.
K = 2.5 with average air circulation, 5 for still brine, and 7.5 for moving brine.
Tr. = Temperature of brine.
Tp. = Temperature of evaporation.

According to this formula:

$$L = \frac{2.3 \times 12{,}000 \text{ B.t.u.}}{5 \times 7} = 787.5 \text{ lineal ft. } 1\tfrac{1}{4} \text{ inch pipe.}$$

The engineer who worked out the calculations for the Chesterbrook Farms obtained for the brine tank, an evaporator with 300 feet of 1¼ inch pipe. As you see, there is a great difference between both results. Which do you think is correct? Or where am I wrong?

In designing small ice making installations up to the production of 440 lbs. of ice in 12 hours, what is the maximum length of ¾ and ⅝ inch copper tubing allowed per thermostatic expansion valve, using gas F-12 as refrigerant? What is the brine and evaporating temperature recommended for these small commercial ice making installations?

ANSWER: There are apparently only three factors which are common to both methods you have used in determining the number of feet of pipe required in the milk cooling system. These are 1¼ inch pipe, 12,000 B.t.u. per hour load, and a temperature difference of 7 degrees between evaporating temperature and brine temperature.

Since the other factors used in the two formulas differ, there is bound to be a difference in the final answer. In the first formula, as used in calculating the Chesterbrook Farm Dairy, a K factor of 5.65 B.t.u. per lineal foot of pipe was used, and the formula then becomes

$$\frac{12{,}000}{5.65} \times 7 = 300 \text{ feet of pipe approximately.}$$

In the second formula, a K factor of 5 B.t.u. per square foot surface of pipe was used. To make these two formulas comparable, let's go back to the first formula where 5.65 B.t.u. per lineal foot K factor was used, and find out what the K factor per square foot is.

There are 2.3 lineal feet of 1¼" pipe per square foot of surface; therefore, according to the engineer who calculated the Chesterbrook Farm, the K factor per square foot of surface would be $2.3 \times 5.65 = 12.995$, or to use round figures, 13 B.t.u. per hour. Restating the first formula, we have

$$\frac{2.3 \times 12{,}000}{13 \times 7} = 300 \text{ feet of pipe.}$$

The second formula, as you stated it, is

$$\frac{2.3 \times 12{,}000}{5 \times 7} = 788 \text{ feet of pipe.}$$

The difference in the results, of course, is due to the different K factor used. I am inclined to believe that the formula, using the K factor of 13 is more nearly correct, and that a factor of 5 is too low for this class of work. At least, I think you would be safe in using a factor of 10 for coils submerged in brine.

There is considerable difference in opinion on the K factor to be used in various appli-

cations of this nature, and it is unlikely that you would get the same answer from any two people you may contact on the subject. However, the above should give you a fair general idea of good practice.

The total length of tubing of any given size to be used on one expansion valve is governed primarily by the pressure drop through that tubing, and what effect this pressure drop may have on the operation of your system. It does not, to any great extent, affect the capacity of the valve; therefore, the total length of tubing that may be used will vary with the class of work being done. For instance, on fin coils, the maximum length of 5/8 inch tubing may be considered as 50 feet, and for 3/4 inch tubing, 100 feet. For bare pipe coils, submerged in brine or water, and where the coils may be operated partially flooded, such as in the type of work you are considering in this dairy application, the maximum length of 1/2 inch tubing would be 75 feet; 5/8 inch, 100 feet; 3/4 inch, 150 feet.

In small ice-making plants, a good evaporator temperature to use would be about 5 degrees, and the brine temperature, of course, will adjust itself in accordance with the amount of coil surface installed in the bath. Of course, there is no harm in reducing this evaporator temperature, except that the total output of the system will be reduced accordingly.

VALERIUS FOUNTAIN

QUESTION 389: I should like to obtain information on the Valerius Soda Fountain which was manufactured at Jefferson, Wisconsin.

I have a job which is freezing up in the bottle cooler, both the sweet-water bath and the bottled goods that are stored. This is a thermo-syphon job, and I have closed the control valve tightly, but it still persists in freezing. I believe the insulation between the ice cream storage compartment and the bottle cooler is wet, which accounts for the bottled goods freezing. Perhaps you can advise some simple way of correcting these two conditions which will not necessitate partial dismantling, or other major repair.

I am unable to locate any service literature on this particular fountain, and if you can supply some, will you kindly advise?

ANSWER: The Valerius Soda Fountain has not been made for several years, and, of course, it is rather difficult to obtain any information on them at this late date, particularly any data that may have been published by the manufacturer. We have no such information on hand, and I am unable to inform you where you might obtain any.

It is quite possible that your trouble is due, in part, to broken down insulation between the bottled goods department and other departments in the fountain. However, it seems highly improbable to me that leakage through the insulation could cause the bottled goods and the sweet water bath to freeze. But this matter should be easily checked, and if it is due to broken down insulation, there would, of course, be an ice formation on the wall between the two compartments, thus indicating leakage.

It is quite possible that your trouble is due to the by-pass valve leaking to the extent that you are only slightly retarding the flow of brine to this compartment. During the long period of service on this valve, it is quite possible that the seat has become eaten away, or so badly corroded that it is no longer possible to shut it off or control it to the desired point. This valve is located at the bottom of the cabinet, and it would be necessary to drain all the brine out of the system before the valve could be changed.

On the other hand, if it is insulation that is causing your trouble, I know of no way in which you can remedy the situation other than by dismantling the cabinet so that the insulation may be removed and either thoroughly dried out or replaced.

KELVINATOR THERMOSTAT SETTINGS

QUESTION 390: Would you please tell me if a service man can adjust a Kelvinator thermostatic motor control to any desired temperatures, by adjusting the range adjustment spring tension nut? A man who has been servicing for ten years says that once they are moved, they cannot be made to operate correctly.

At 28 degrees F. cut-in and 17 degrees F. cut-out, would the top of the evaporator show sweat on its shut-off cycle? How many degrees difference is the top of the evaporator and the bottom of the evaporator? Should an evaporator hold its frost at a cut-out temperature of 17 degrees F. and a cut-in temperature of 28 degrees F., of a KS-5 model Kelvinator unit? What temperature would the box or cabinet be if the evaporator is kept at 28 degrees F. cut-in, and 17 degrees F. cut-out? Would the temperature drop to 17 degrees F. plus 20 degrees F. difference, equalling 37 degrees F., or would the temperature go to a higher figure?

ANSWER: A cut-in temperature of 28°, and a cut-out temperature of 17° should be satisfactory for the Kelvinator refrigerator, and providing all other conditions are correct, there should be no defrosting of the evaporator during the off-cycle. Likewise, the temperature between the top and bottom evaporators should vary only slightly, providing other conditions are as they should be.

It isn't possible for me to say what temperature the cabinet would be for these settings, since this will depend entirely on the condition of the cabinet and the relation of size between the evaporator and the cabinet in which it is installed. As a usual thing, however, the temperature should be within the recommended range of 40°.

I am inclined to believe, from your description, that your trouble is due to a lack of refrigerant in the system. The Kelvinator system is usually the highside float type, and when the system becomes low on refrigerant, it permits the space on top of the evaporator to be left without any refrigeration. You understand, of course, that a highside float system is the flood type of system, and that nearly all the refrigerant is contained in the evaporator. The proper charge of such systems is determined by the amount of refrigerant that the evaporator will hold. Therefore, in adding refrigerant, it is necessary to continue charging until frost appears on the return line, which indicates to you that the evaporator is full of liquid, and it is beginning to spill over to the return line.

After the machine has been permitted to run a sufficient length of time, so that the frost line on the suction line has had an opportunity of stabilizing at some point where you can readily see it, then it may be necessary to purge off a small amount of refrigerant until the frost line returns to within ten or twelve inches of the outlet from the evaporator.

I believe if you will add refrigerant to this system in the manner in which I have outlined, you will find that your troubles are overcome.

FRIGIDAIRE BEVERAGE COOLER

QUESTION 391: I was called to service a Frigidaire beverage cooler using a ⅓-hp. condensing unit, and having a high side float valve as the metering device, and controlled by a thermostat. The condensing unit was placed in the basement, and after testing, was found to have lost its charge of Freon. I charged the system and tested the unit for leaks, which I repaired.

I checked the system again the following day and found that the machine was cycling all right and that the water in the cooler was at a temperature of 33 degrees. However, a week later I again took the temperature of the water, and although it was still 33 degrees, the owner claimed that the bottles and cans (beer) were not cold enough if they were not kept in the water. He claims the cooler was sold to him with the understanding that the bottles and cans would get cold without any water in the cooler.

Please inform me if it is possible to obtain such results without submerging bottles and cans in water, in this type of cooler.

With no water in the cooler, the owner piles cans and bottles right up to the sliding covers, and in that way he can put more in the cooler than if he placed them in the water, and that is the reason he does not want to keep water in the cooler, but wants to cool the beverages dry.

ANSWER: I am unable to tell whether the Frigidaire beverage cooler in question is designed as a dry type of cooler, or as a water bath type. This should be determined, however, by the fact that a dry type of cooler would have a fin coil in it, while the water bath type would have a bare pipe coil as the lowside.

Operation Depends on Coil

If the unit is designed to utilize a sweet water bath, then it is hardly possible that satisfactory results can be obtained by omitting the water bath, unless certain changes are made. To begin with, a unit designed to utilize a sweet water bath would very likely not have sufficient coil area to operate as a dry system. Second, when operating as a dry system, the evaporator temperatures should be somewhat lower than they would be when operating with a water bath. The cut-in and cut-out pressures on a dry system would be close to that of any other defrosting coil, such as is utilized in the walk-in cooler, or other such applications. Third, the beverages to be cooled would have to remain in the cooler a greater length of time where the dry type of cooler is used than they would when submerged in a water bath.

Of course, it is quite possible that this cooler is designed to be used either way as your customer claims, and in such case, it is probable that the cooler is equipped with a fin type coil. If this is so, then I think that the only changes necessary would be the second and third items mentioned in the above.

MILK COOLING

QUESTION 392: I have a milk storage room to refrigerate 7 feet high x 11 feet x 15 feet, inside dimensions, insulated with four-inch corkboard. This room is to contain a brine tank five feet high, six feet long, and two feet wide, for cooling about 200 gallons of milk from a 100-gallon pasteurizer (two batches) once a day, the milk to be cooled over a new 6-foot enclosed type aerator with the top section precooled with well water at 52 degrees.

The bottler has a capacity of 100 gallons in 20 minutes, but my customer is willing to run the bottler slower if necessary. The brine tank already has a coil of 75-100 feet of ⅝-inch copper in it with thermostatic expansion valve. As an auxiliary cooling coil, he has a Frigidaire C-440 blower coil. This is operated with a Frigidaire "C" compressor, one-horsepower, 2½-inch bore, 3½-inch stroke, 360 rpm., 16¾-inch flywheel with a rating of 516 pounds, 14 hours, 80 degrees condensing medium, 7-inch back pressure, 20-degree coil, in their rating. The blower is controlled through an E.R.V. and compressor with a pressure switch. The water to cool the condenser will come from a deep well. SO_2 gas is used in the equipment now.

1. Will this compressor do the work required? 2. Will the brine tank and C-440 refrigerate the room? This job has been working with a smaller cooling room and smaller aerator with the same bottler and same amount of milk. 3. Could this job be changed over to F-12 or methyl gas to an advantage? If so, which gas would you recommend in this case? What size motor should be used? What compressor speed? Will any other changes other than expansion valves be required? 4. Would you recommend controlling the compressor with a thermostat bulb immersed in oil well in the brine? 5. Could a snap-action valve be used on the blower coil in this set-up to assure defrosting? The cooler temperature will be 40 degrees.

ANSWER: According to my calculations, the amount of heat to be removed from 200 gallons of milk will be 47,500 B.t.u. per day, or in other words, regardless of whether the 200 gallons is run over the aerator all at one time, or whether it is run over in two batches, the load on the machine will still be 47,500 B.t.u. per day. This we might term the "product load."

The load, due to heat leakage through the walls of the walk-in cooler, including the service load, will amount to about 78,000 B.t.u. per 24 hours. Therefore, our total load for the above two items will be 125,500 B.t.u. Since we will not want our machine to run more than 16 hours per day, it will have to have a capactiy of 7,850 B.t.u. per hour.

The Frigidaire Model C compressor, is capable of delivering 5,807 B.t.u. per hour, which, of course, is not nearly enough to handle this job. If we change the system over to a Freon system and increase the motor size to the next larger size, we can expect an increase in capacity of about 30%.

We could also increase the compressor's speed slightly, thus further increasing the output of the unit, and it may be that we could reach a capacity which would take care of the load imposed on the unit.

You will notice, of course, that through these calculations I have not taken into consideration any load due to other products placed in the refrigerator, such as butter, cream, cheese, and so forth. You haven't given me any information on this, and I don't know whether there are other loads to be considered.

Run Milk Slower

All this, of course, has nothing to do with how fast the milk is run over the aerator, since we are considering only the average load per hour over a 24-hour day. There is one more factor which might help, and that is, if the milk is run over slow enough that the well water will cool the milk down to a lower temperature than the 70 degrees used in these calculations.

I noticed in the calculations you used that you consider the temperature difference of 30 degrees, or in other words, a cooling range from 70 degrees to 40 degrees, which would have to be provided by the refrigerating system. If it is possible to reduce the milk temperature another five degrees by the use of water, the load on the refrigerating machine would be reduced considerably, and it is quite likely that this machine would have sufficient capacity.

I have no data on the C-440 coil, and cannot determine whether this is large enough to refrigerate the room; however, I don't believe that it would require a very large coil to do this work, since the brine tank is installed in the refrigerator, and it will supply considerable refrigeration to the cooler.

As for the control set up, I believe those used at the present time would be the best to continue with. There would be no advan-

tage in having a thermostat bulb immersed in an oil well in the brine. The snap-action valve on the blower coil would be necessary to assure self-defrosting, if you find it necessary to reduce the brine temperature down below that of the blower coil, or in other words, if the coil in the brine tank is operated at a much lower temperature than the blower coil.

CONVERTING BEVERAGE COOLERS

QUESTION 393: We would like some information as to how we should hook up a G. E. Commercial Unit to two beer coolers. Both coolers have about eight inches of water in them all the time, to accommodate the cooling of bottles. Would it be proper to run a ⅝-inch tube immersed in water to both coolers, using one expansion valve? The coolers are attached to each other.

ANSWER: I see no reason why both coolers should not be hooked up on one expansion valve, providing the total amount of ⅝-inch tubing used does not exceed one hundred feet. This is about the maximum amount of ⅝-inch tubing that can be used on one expansion valve without encountering too great a pressure drop.

Submerging the tubing in water, of course, will increase the heat transfer between refrigerant and water bath, and will provide a more efficient method of cooling.

MILLS COMPRESSOR OK

QUESTION 394: I would appreciate receiving information on the following problem:

The cabinet is a 5.5 feet x 6 feet x 5 feet, insulated with 6-inch cork, and used as a storage for ice cream in a creamery. The temperature is to be kept at 10 degrees F. to zero degrees F. The cooling coil is made of 146 inches of one-inch steel pipe.

The unit formerly was mounted above the cabinet, but a new one has been installed at the base of the cabinet. The thermal expansion valve feeds in at the top and the suction line feeds out from the bottom. The one-horsepower unit took care of the box fairly well until the head leaked and flooded the system with water. A new Mills one-horsepower unit has been installed—water-cooled, but the new unit does not seem to have enough capacity to pull the box down.

I blew out the box coil with CO_2 gas to drive out the moisture and oil and run the system under a vacuum for a day, heating up the coils, compressor, and receiving tank three times. I do not have any more trouble with the thermal valve freezing, but it does not pull a low enough vacuum to get a 10-degree F. temperature. I also installed a solenoid valve in the liquid line before the thermal valve that closes on the stopping of the machine.

There is about 17 pounds F-12 refrigerant in the machine, so I don't think it is low, but the pressure will not go low enough to give 10-degree F.

The motor takes 6.4 amps full load at 220 volts. On checking, I found it was taking only 3 amps, so I increased the pulley on the motor from 4¼ inches to 7½ inches, increasing the compressor speed from 517 rpm. to 930 rpm. Do you think this is advisable? The motor still takes only 4.5 to 5 amps. This increase did help to pull the box temperature lower.

If I opened the expansion valve too much, the compressor would not pull it down as fast as it was fed in, and if it wasn't opened enough, it wouldn't frost the full length of the coil. Will this size compressor operate satisfactorily on that box?

ANSWER: The one-horsepower unit installed on the 5.5 x 6 x 5 storage cabinet should be large enough to take care of the cabinet at a zero degree temperature. I take it for granted, of course, that the ice cream is down to within a few degrees of the zero degrees before it is placed in the storage cabinet; therefore, the product load is very slight.

More Speed Will Not Help

There should be no necessity for increasing the speed of this compressor, and from your own experience, it can be seen that the increase in speed has contributed nothing to the over-all operation. The motor is running under a very light load, and it is evident that the Mills machine is not being permitted to provide its full capacity in refrigeration. All this leads to an indication that your trouble is elsewhere, and I am of the opinion that it is in the expansion valve. Either the expansion valve is defective, or you have installed one with the wrong size orifice, so that proper refrigeration of the coil is not being obtained.

You state that when you open the expansion valve enough to get refrigeration all the way through the coil, the compressor will not pump it down, and I take it for granted that you mean by this that the return line floods all the way back to the compressor; then, if you close down the valve slightly, the coil does not frost the entire length. This, too, indicates that the valve is either defective or the orifice in it is too large.

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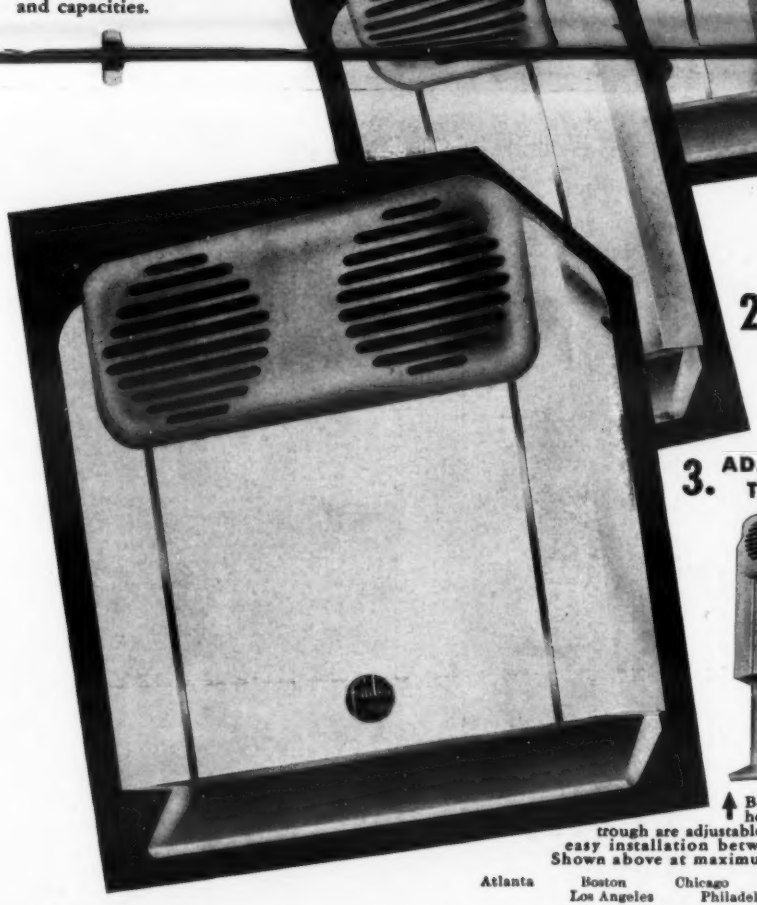

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I would suggest that you remove the valve and test it for proper operation. Then, if you find it is operating properly, that you take the matter up with your jobber, with a view to securing a valve with the proper orifice size.

S S S

Clayton J. Lovejoy
New York

Your magazine is the best of its kind and every serviceman should be a subscriber for it keeps one up to date on all the latest refrigeration improvements.

S S S

ADJUSTING PROCEDURE ON "LIFETIME" SODA FOUNTAIN 1936-39

An article in the July issue described service operations on Liquid Carbonic "Lifetime" soda fountains. The adjustment procedure, however, was not complete. The following is provided to complete the instructions under the heading "Adjusting Procedure," on page 28 of the July issue.—Editor.

WITH the ice cream evaporator valves (and salad unit if connected to the same compressor) closed:

1. Add three pounds of gas to the condensing unit for the water bath evaporator, ½ pound of gas for every 10 feet of ⅜ inch liquid line to compressor and 1/10 lb. of oil for every one pound F-12 gas added.

2. Turn the TRV-20 adjustment down to position 4 or thereabouts to insure that this valve stays open during the adjustment of the TEV and start the compressor. Set the TRV bulb approximately ½ inch from the front evaporator.

3. When the water bath in the water cooling section has pulled down in temperature so that an ice formation is obtained on the rear tubing, adjust the TEV so that ice will form clear to the TEV bulb which is clamped to the front tubing near the top of the coil. Opening ("raise") the TEV will cause ice to form on the front tubing.

Do Not Force Adjustment

CAUTION: The TEV is wide open when the clip above the adjusting nut is snug against the nut. Do not force this adjustment further as this clip will jump off. If the clip jumps off, close the valve completely by turning the adjusting nut counter-clockwise ("lower") and replace the clip.

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4. When this adjustment has been obtained, turn the TRV-20 back to between position 2 and 2¼.

5. Open the valves on the ice cream evaporator (and salad unit).

6. It will be necessary to check the adjustments within two or three days and readjust the TEV and TRV as necessary to obtain an ice formation on the water bath front evaporator.

The final adjustment of the TRV will be somewhere between 2 and 3. Use Frigidaire tool SA-985 which costs about ten cents to adjust the TRV. The TRV adjustment may stick due to ice forming on the body of the valve. Do not force the adjustment but stop the compressor and melt the ice off the valve body with cool water to warm the valve and free the adjustment. After readjusting the TRV, start the compressor again.

REFRIGERATION SERVICE ENGINEERS' SOCIETY

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NOW is an opportune time for the service engineer to plan his annual vacation. Unfortunately, when most people are enjoying vacations during the hot, humid months, the refrigeration engineer, because of the nature of his business, is required to be on the job long hours, attending to refrigeration equipment which requires attention due to the peak load demand.

However, here is a suggestion for the ideal vacation for the refrigeration service engineer. In addition to the vacation features, it can be made a profitable visit. Attend the 7th Annual Refrigeration Service Engineers Society Convention in Chicago, January 13-16. Although we can't promise that you can take advantage of all the summer sports for which Chicago is noted, nevertheless, your trip will be a memorable one.

The R.S.E.S. convention is being held in conjunction with the 3rd All Industry Refrigeration and Air Conditioning Exhibition. This exhibition, exceeding in size even last year's huge show, will provide some 200 exhibits featuring every conceivable item used in refrigeration work.

As in previous years, the R.S.E.S. meeting is planned to include in its educational program outstanding speakers on subjects of pertinent interest to all service engineers. These speakers and their subjects have become an institution in the industry. New innovations will be adopted to make the program concise, interesting and informative.

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OIL SEPARATOR

A Corrective Device Which Rejuvenates Efficiency . . . Eliminates Troubles

Provides scientific, effective separation of oil from gas and return of oil to crankcase.

Some "Oilrite" advantages are:

1. Increases system capacity as much as 20%.
2. Reduces evaporator temperature 4° to 8°.
3. Permits refrigerant to evaporate at true boiling point.
4. Prevents dirt, scale, hard and soft carbons entrained in oil from reaching and plugging strainers and valves—improving valve operation.
5. Provides constant oil level in compressor, eliminating worn seals, scored cylinders and bearings—adds years of efficiency to older and new equipment.

Approved by Underwriters Laboratories, Inc. Ask your jobber or write us for Bulletin R-5.

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Central Supply Company.....Indianapolis, Ind.
Republic Electric Company.....Davenport, Ia.
Dennis Refrigeration Supply.....Des Moines, Ia.
S. W. H. Supply Company.....Louisville, Ky.
Parks and Hull Appliance Company...Baltimore, Md.
A. E. Borden Co.....Boston, Mass.
J. M. Obere, Inc.....Detroit, Mich.
Young Supply Company.....Detroit, Mich.
Thermal Co., Inc.....St. Paul, Minn.
Forslund Pump Company.....Kansas City, Mo.
Brass & Copper Sales Co.....St. Louis, Mo
Wallwork Brothers, Incorporated.....Newark, N. J.
Ruegg Refrigeration Supply.....Lincoln, Neb.
Aird-Don Company.....Albany, N. Y.
County Seat Plumbing Company..Mount Vernon, N. Y.
Henry V. Dick & Co.....Charlotte, N. C.
Hasco, Inc.....Greensboro, N. C.
Debes and Company.....Cleveland, Ohio
Refrigeration Electric Supply Co.....Columbus, Ohio
The W. H. Kiefaber Co.....Dayton, Ohio
Macklanburg Brass & Copper Products, Inc.....Oklahoma City, Okla.
Jacobs & Gile, Inc.....Portland, Ore.
Larson Supply Company.....Allentown, Pa.
Larson Supply Company.....Reading, Pa.
M. & E. Refrigeration Accessories Company.....Philadelphia, Pa.
William M. Orr Company.....Pittsburgh, Pa.
Leinart's Refrig.Parts and Supply Co...Knoxville, Tenn.
United Refrigerator Supply Co.....Memphis, Tenn.
Walter Refrigeration Supply Co.....Houston, Tex.
The Electromotive Corporation.....Dallas, Tex.
Noland Co., Inc.....Norfolk, Va.
Refrigerative Supply Inc.....Seattle, Wash.
Gustave A. Larson Co.....Milwaukee, Wis.

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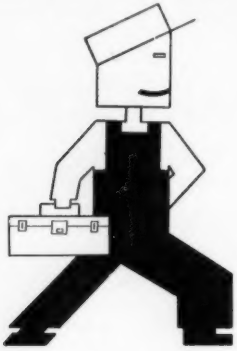
49 Piquette Avenue — Detroit, Michigan, U. S. A.

The educational sessions are planned to permit time for extended visits to the exhibits. A full day is allowed for the exhibits and in addition each afternoon and evening the exhibits are open.

On Tuesday the annual banquet will be held with the R.S.E.S. party scheduled for Wednesday evening.



The Ladies Auxiliary will have their meetings, and entertainment will be especially provided to occupy the time and to make the visit for the ladies an enjoyable one.

Plan now for your attendance at the Refrigeration Service Engineers Society Convention. Bring the family—they will have a good time. Start 1941 right by attending the R.S.E.S. convention January 13-16. It is a good business investment for you.

* * *

DALLAS GETS NEW SERVICE COMPANY

ORGANIZATION of a new service company, to be known as the Refrigeration & Air Conditioning Maintenance Co., was announced recently by J. H. McDowell, one of the founders. Associated with Mr. McDowell will be Ward Pennington, formerly of St. Louis, Mo.

The two service engineers have been active in organization and support of the Dallas chapter of the Refrigeration Service Engineers. Until announcement of his associating with Mr. Pennington in the new project, Mr. McDowell was associated with the Dallas Air Conditioning Co., Inc.

The new company will seek contracts with users of refrigeration and air conditioning for maintenance and inspection of facilities.

Why do Servicemen call THAWZONE "The MAGIC FLUID"? . . . . . .

There are two ways to get acquainted with Thawzone. Buy a can from your jobber and use it. Or—write us for comprehensive, technical folder on Thawzone and its application.

Highside Chemicals Co.
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THAWZONE
Fully Protected by U. S. Patents
The PIONEER FLUID DEHYDRANT

Because—

this radically different, easy-to-use, inexpensive chemical dehydrant really does everything claimed for it! Namely:

- **Destroys Moisture**
- **Clears Freezeups**
- **Keeps Systems Dry**
- **Neutralizes Acids**
- **Prevents Corrosion**
- **Inhibits Copper-Plating**

There's only *One* like *Al*

Our *Al* is set in his ways, a hard character, and a hard drinker; you can't change him, and you can't beat him. If you know that Al is Activated Alumina, heart and soul, you can understand that.

Because Activated Alumina is a drying agent for dehydrators which is different and unchanging. It is the *one* drying agent preferred by the largest number of service men, and it is esteemed highly because in actual use it does what laboratory tests show it should do: it quickly removes all trouble-making moisture from the refrigerating system. In addition it takes out acid, thus preventing dilution and decomposition of the refrigerant, corrosion of the mechanism, and the formation of sludge in the lubricant.

To be sure of a drying agent which does a thorough job, say "Activated Alumina" when you buy dehydrators and replacement parts. ALUMINUM COMPANY OF AMERICA, (*Sales Agent for* ALUMINUM ORE COMPANY) 2159 Gulf Building, Pittsburgh, Pennsylvania.

These Manufacturers Supply Dehydrators Charged with Activated Alumina

•

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McIntire Connector Co.
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Universal Cooler Co.

★ ALORCO ★

ACTIVATED ALUMINA

DRIES REFRIGERANTS DRY

ILLINOIS STATE R.S.E.S. TO MEET AT PEORIA

PACKED with educational and entertainment features, the 3rd Annual State convention of the Illinois Chapters of the R.S.E.S. will convene on Saturday and Sunday, October 21 and 22 at the Hotel Jefferson, Peoria, Illinois.

These two-day State conventions provide a pleasant opportunity for the State members, their wives and friends to join in two days of social contacts and business relationships.

Educational programs will occupy the morning sessions of the two days and on Saturday evening the annual banquet will be held.

The headquarters will be at the Jefferson Hotel and invitations are being extended to members and chapters in neighboring states.

ONE-STOP SERVICE

SPECIALIZED TOOLS for REFRIGERATION WORK

Here's the set that equips you with those special packing gland nut and square valve stem wrenches you need for fast, efficient "one-stop" service. Service Set No. 201-B contains Snap-on's NEW 4-in-one refrigeration ratchet, extension, ratchet plugs, double-broached hexagon sockets, square valve stem sockets, Kerotest socket and packing gland sockets—all fitted into a small, ready-to-carry metal case.

Snap-on tools are available through branch warehouses in 35 principal cities. See your Snap-on salesman or write for complete information.

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KENOSHA, WISCONSIN

• *Investigate this Lower Priced Refrigeration Control* •

FRIGIDAIRE'S PRECISION BUILT "YL" SWITCH

- ✓ One Model for All Common Refrigerants (Freon 12; SO_2; Methyl Chloride)
- ✓ Simpler, More Compact Design
- ✓ More Easily Adjusted—has visible scale for preliminary setting
- ✓ Furnished with Low Pressure or Thermostatic Control
- ✓ With or Without Motor Overload Protection
- ✓ High Pressure Cut-Out If Desired (Comes in double unit case)

Available in various combinations of units to adapt it to every refrigeration need. Differential—Thermostatic type—minimum 3 to 4 degrees, maximum 10 degrees...Low Pressure type—minimum 5 lbs., maximum 55 lbs.

A MODEL FOR EVERY COMMERCIAL REFRIGERATION NEED

Model TOO: (Shown at Left) Thermostatic control without High Pressure Cut-out. Cold Control standard (as illustrated).

Model TOH: Thermostatic control. Includes High Pressure Cut-out. Double unit case. Cold Control standard.

Model LOO: Low Pressure control without High Pressure Cut-out.

Model LOH: Low Pressure control. Includes High Pressure Cut-out. Double unit case.

Overload protection is available in any model as desired.

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Write your Frigidaire Distributor today for new low prices. Ask for your copy of descriptive booklet with full details.

TO SATISFY YOUR EVERY REFRIGERATION SERVICE NEED

MEMBERS OF LONE STAR ENTER MANUFACTURING

TWO members of the Lone Star chapter in Dallas, Jack Langston, president of Jack Langston Co., and his son, Jack Langston, Jr., who is associated in business with him, have announced to the refrigeration industry the completion of the first of a line of display cases and other commercial equipment to be manufactured by them.

Mr. Langston and his son, both of whom have been active in chapter affairs since the group's inception, spent more than two years in working out the design for their case. It represents the experience of more than 17 years in the industry by the elder Mr. Langston.

Coils At Three Levels

The new case is provided with three coils, placed in bottom, center and top of the box. This innovation, it is contended, will achieve a much lower temperature differential as well as improvement in relative humidity. The equipment will be cork-insulated throughout, and porcelain will be set in insulating rubber.

Chapter Notes

Under this heading will appear news of the chapter meetings. For names of the officers and dates of regular meeting nights, please refer to the Chapter Directory.

DAYTON CHAPTER

August 30—This was the first meeting of the fall season and it enjoyed a very good attendance. President R. J. Brown opened the meeting and conducted the business session that followed. A vote of the members carried the decision to hold a dinner meeting on September 12 at the Dayton Engineers Club.

LONE STAR CHAPTER

July 15—Visitors of the evening included Mr. Ira Cochran of Imperial Brass Company, Mr. Dawson of Alco Valve Company, Mr. R. K. Pepple and Mr. Sloan from McCray Company. All of these gentlemen in turn were called upon, and responded with a few remarks to the meeting.

It was agreed by the members that a letter of thanks be sent to the Wolverine Tube

(Continued on page 46)

LONE STAR CHAPTER TUBE BENDING CONTEST

Carl Cline, Southern Refrigerator Co., Dallas, was the winner of this tube bending contest between members of the Lone Star Chapter. Several of the contestants are shown on the floor at the half-way point. The contest was conducted by the Imperial Brass Co., in the offices of the Wolverine Tube Co., Dallas.

"I find it hard to do without," so says this service man

• Now that the Calculator is being put to the test of practical use in the field, we have had a number of letters from service men testifying to its value. This one is typical.

Raton, N. Mex.

Enclosed please find $1.00, please send me your Head-Back Pressure Calculator.

I lost mine and find it very hard to do without.

Yours truly

Merle Rankin

WRIGHT'S

H. B. P.

CALCULATOR

The purpose of the Head-Back Pressure Calculator is to quickly determine the proper head pressure, for the following refrigerants when the suction pressure, room temperature or mean water temperature is known.

Carrene	Methyl
Isobutane	Freon or F-12
Sulphur Dioxide	Ammonia
Carbon Dioxide	

Actual Size 3½" x 3½".

A Vestpocket Tool Every Service Man Should Carry

A number of troubles can be detected by comparison of the existing head pressure and what the head pressure should be, but in the past there has been no convenient method available to the service engineer to determine what the correct head pressure should be. Such variable conditions as the suction pressure, room temperature, water inlet and outlet temperature, kind of gas used, etc., all determine the proper head pressure. It is not practical to depend on one's memory of other similar conditions or to just use snap judgment when this handy calculator gives you the correct answer so easily. Send for it today! Sturdily constructed, with oil-proof finish, for on-the-job use.

POSTPAID $1.00

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Commercial Refrigeration and Comfort Cooling

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Just Published

A practical book

—practical in the method it provides for figuring actual load calculations.

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FOOD STORAGE CONDITIONS
LOWSIDE EQUIPMENT
TYPES OF REFRIGERATION
LOAD CALCULATIONS
SELECTION OF LOWSIDE EQUIPMENT
HIGHSIDE EQUIPMENT
SOME RECENT DEVELOPMENTS
EXEMPLARY INSTALLATIONS
COOLING FOR HUMAN COMFORT
AIR CONDITIONING FOR THE HOME

The author, with a wide knowledge of refrigeration applications, has endeavored to adapt this book especially for the use of refrigeration service engineers, refrigeration equipment salesmen, and architects. It especially emphasizes engineering methods in common use today.

It specifically treats the subject of the smaller types of commercial equipment as installed in the modern retail shop or restaurant, eliminating any discussion on domestic or industrial refrigeration application.

Its contents include valuable information on food storage conditions covering the most common commodities held under refrigeration, proceeding logically to load calculations, types of equipment most suited to various conditions, and most important, hypothetical and actual examples of how to figure load calculations. It is one book that *shows you "how."*

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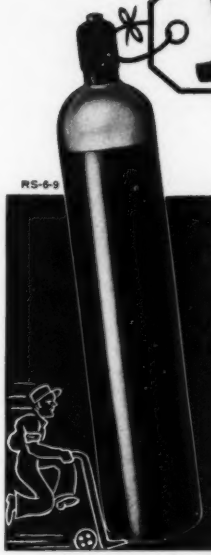

• At the least, Ansul estimates, 300 million pounds of liquefied sulphur dioxide have been shipped and used for refrigeration purposes in the last 20 years. What better recommendation could anyone write for *the best refrigerant for household units yet developed?*

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EACH CYLINDER INDIVIDUALLY ANALYZED

ANSUL CHEMICAL COMPANY, MARINETTE, WIS.

AGENTS FOR KINETICS "FREON—12"

"Mills" is the most important name in commercial refrigeration today. Write Mills Novelty Company, 4100 Fullerton Avenue, Chicago, Illinois.

Now you can service
FRIGIDAIRE
METER-MISERS

do it with
HERVEEN

★ For almost two years now, we have been supplying service shops with *Herveen* through our jobbers located all over the country. If you haven't yet learned how you can earn these extra profits, you'd better ask *your* jobber today. As the demand for Hermetic servicing increases it becomes more and more profitable for the well-equipped shop to handle this work. That's where we come in, *Herveen* is the replacement gas that enables you to service Meter-Misers.

HERVEEN
brings in business

★ Why not plan to get this profitable extra business for yourself? Refrigeration jobbers all over the country handle *Herveen*, if yours doesn't, write us direct.

HERVEEN

MODERN GAS CO., Inc.
Manufacturers and Refiners
1084 Bedford Avenue, Brooklyn, N. Y.

Company for the hospitality shown the Lone Star Chapter at their meeting of July 1. C. W. Barron was the winner of the attendance kitty for the evening. The meeting was held in the home of J. M. Bibb, and after the meeting was adjourned refreshments were served to the members and their guests.

August 5—In the first August session, held in the Wolverine Tube Company warehouse, the chapter decided to undertake the compiling of a refrigeration directory for the entire Northeast Texas area. It was reported by H. W. Cline, President, that a careful study of the feasibility of the project had been made and that this indicated that resources of the refrigeration and air conditioning industry in the area would make possible publication of a booklet of 100 pages. The plans call for a directory including not only the service engineers of Dallas, but those of the entire area. There would be a listing of individuals and business organizations dealing in supplies or equipment, and the publication would be financed through the sale of display advertising space to manufacturers and others. It was pointed out that with successful handling, the directory should net upward to $600 for the chapter. Mr. Cline was authorized to designate a committee of five to work with him in preparing a detailed plan for the undertaking.

The educational program consisted of a demonstration by Page Edmonds of the Silica Gel Department of Davison Chemical Company on the use of Silica Gel as a means of removing moisture from refrigerants.

Following this, the tube bending contest was participated in by five of the chapter members. The winner of the contest was Carl Cline, and the contest was conducted by representatives of the Imperial Brass Company. Iced watermelons were served to the group following the contest.

August 19—Indications are that the activities of the chapter already have gained the attention of the civic organizations in the city, chiefly, the Dallas Chamber of Commerce, which communicated with the chapter by letter, read at the meeting of this date. The letter requested the chapter to bring to Dallas a national or regional convention of the Society and promised its full support in any such undertaking. The Chamber of Commerce also praised the chapter for its stand on subversive activities within the Nation. This action was taken several weeks

ago when it was made a part of the obligations of membership to report any seeming Fifth Column efforts which might be observed.

Harry J. Burman of Dole Refrigerating Company and Lou Snell of the Midwest Equipment Company addressed the meeting. Mr. Snell urged the service engineers to become more sales minded, and instead of merely repairing parts, to sell new equipment. Mr. Burman expressed the belief that the vast expansion of the frozen foods locker industry would correspondingly increase the opportunity of service engineers, who made themselves authorities in this field of service, and that a considerable increase of business would result as the industry grows.

ILLINOIS VALLEY CHAPTER

August 9—A very splendid meeting was held on this date with a large number of members present. The educational program consisted of a talk entitled, "Locker Systems That Pay," by Jerry Wilkerson of the Dole Refrigerating Company. Mr. Wilkerson handled the subject very well, and the information he gave was most enlightening to those present.

TWIN CITIES CHAPTER

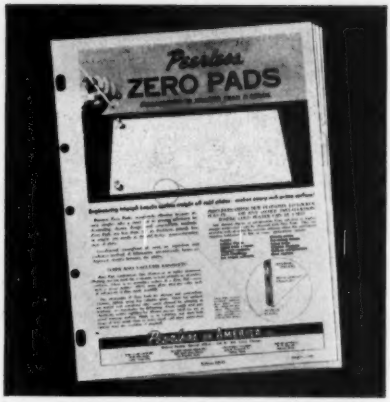
August 13—President Warner presided over the meeting, and after the routine business was disposed of, the bowling committee, headed by I. L. Rubbelke, reported progress in arrangements for the bowling team of the 1940-41 season.

A. M. Palen of the Code Committee read over the code as it stood to date for the benefit of those who were not present at the last meeting, and gave a complete report of the ideas suggested to date. Discussion on the code followed with some helpful points being brought out.

A. L. Mattison's name was drawn for the attendance kitty, but due to his absence, the amount was returned to the treasury to be held over to the next meeting.

SAN DIEGO CHAPTER

July 11—The regular meeting of the month was held at Hawley House, 2720 Fourth Street, on this date. Dinner was served, and immediately after, a brief business meeting was held, during which several matters were taken up, including the



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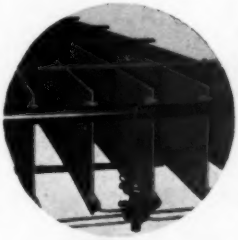
The space-and-weight saving cold plate for—



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Get This CESCO Healthguard FUME KIT . . . and

Be SAFE!

★ Be ready to deal with those "please come quick" service calls. Take no chances with your health. Stay on the *safe-side* . . . and STAY ON YOUR JOB!

Cesco's Healthguard Fume Kit for refrigerator service men, includes comfortable gas-tight mask and interchangeable cartridges proved for protection against the common refrigerant gases. Packed in compact, easy-to-carry case, with full directions. Always ready to "GO" when a call says "COME." You'll be surprised at the low price of this Safety Kit, too. Write today for full details. A postcard will do.

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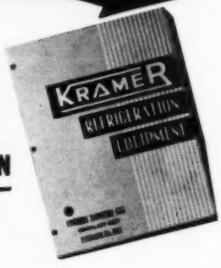

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EQUIPMENT

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KRAMER TRENTON COMPANY
TRENTON, NEW JERSEY

election of a new secretary. M. R. Hanks was elected to succeed Mr. McDowell, who resigned at the last meeting.

Following the business meeting, two guests were introduced. Mr. Forrest E. Jernberg of Mills Novelty Company was presented by Mr. Pitts, and J. B. Ross of Linde Air Products, the speaker of the evening, was introduced by H. E. Friedrichs.

Mr. Ross' talk on the use of Presto-O-Lite in the servicing of refrigerating equipment proved very interesting and educational. A vote of thanks was extended to Mr. Ross and Linde Air Products by the entire chapter.

KANSAS CITY CHAPTER

June 1—The main event of the evening was a tube bending contest conducted by Charles Anderson, Imperial Brass Manufacturing Company, and participated in by the following members: Jules P. DeWilde, Richard E. Meeker, A. M. Hoover, Elmer Bloesser, Charles Campbell, Roy F. Cox. Before the contest started, Mr. Anderson elaborated on the line of Imperial products, and especially the new flare block and yoke manufactured by Imperial Brass. Materials for the contest were supplied by Imperial and were all laid out on the floor prior to the start of the contest. The winners were Richard E. Meeker, Jules P. DeWilde, and Elmer Bloesser.

Mr. and Mrs. E. J. Storm of the St. Joseph Pony Express Chapter, were visitors of the evening. The Kansas City Ladies Auxiliary also attended the meeting.

June 25—The ladies provided the men with a very enjoyable luncheon prior to this meeting. When the meeting began, the minutes were read and the usual routine followed. Mr. Lane of the United Diesel Power School read to the meeting a letter received by him from the Packard Motor Company declaring that it was their intention to train their own mechanics in the servicing of air conditioning on the Packard automobile. This letter caused much discussion in an effort to determine what the effect might be. During a discussion on what the effect of sealed units in the domestic field would be on the service man, Mr. Hataway expressed the belief that other applications in refrigeration would take their place. Locker plants were suggested as one item which was doing much to fill the place of service lost in the domestic field.

July 23—After the business of the eve-

ning was completed, Mr. Thompson, Educational Chairman, threw the meeting open to general discussions. Among these, Mr. Floyd Smith explained in detail the slow purge method used on Hotpoint units charged with Methyl Formate.

It was announced that this would be the only meeting of the month and that the Chapter would hold only one meeting in the month of August also.

ST. LOUIS CHAPTER

June 27—After the meeting was called to order by President Petri, Mr. Gygax spoke briefly on the pending refrigeration code, which, due to the summer recess of the aldermanic body, will not be acted upon before the fall session. He introduced Paul Domke of the Mueller Brass Company, who very ably made a presentation of their entire line of products.

A soldering contest was then conducted by Ed Journ, local representative of Mueller Brass, assisted by Howard McBrayer as timekeeper, and Henry Brockgreitens as judge. Entries to the contest included: E. J. Karl, L. L. Vollman, C. Ochs, E. C. Fix, D. R. Condren, R. H. Bruns, C. H. Tiemann, J. O. Spitznagel. The contest was run off in groups of three, the ultimate winner being E. C. Fix, with a new national record of six minutes, thirty-five seconds elapsed time.

An abundance of refreshments, generously supplied by the Mueller Brass Company, rounded out a perfect evening.

MONTGOMERY CHAPTER

August 5—The educational program included the showing of a three-reel film taken by Herman Goldberg of Chicago, and showing a complete resume of the Chicago, 1939 convention. The operator of the projector seemed to have a little trouble in getting started, due possibly to a lack of experience in the art of showing movies, but after a few minutes everything went off well and a good time was enjoyed by all those in attendance.

August 22—The entire meeting was spent in the business of the chapter, the collection of dues and the arrangement of future entertainments. Some discussion was held on ways and means of increasing the membership and chapter attendance. There was also some discussion on future programs of the meetings for the purpose of endeavoring to line up a definite program for the winter

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● It's easy to service the capacitors used for motor-starting in most makes of electric refrigerators, if you follow "The Aerovox Way."

Use Aerovox listings to pick out the correct exact duplicate replacement for any make and type motor. In the absence of name plate or other means of identification, then use the Aerovox Capacitor Selector, which immediately indicates required capacity value. Use the Aerovox Emergency Capacitor for a temporary repair. Replace later with an exact duplicate unit.

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Ask to see the Aerovox Capacitor Selector, Emergency Unit, and a typical exact-duplicate capacitor. Ask for latest Aerovox motor-starting capacitor catalog—or write us direct.

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months. It was decided that the chapter should only meet once a month in the future and that every alternative meeting would take the form of a social entertainment.

OIL CAPITAL CHAPTER

June—The meeting was called to order by the president, and immediately turned over to H. T. McDermott who expressed words of greeting from the National Office and from other chapters throughout the country. Following this, the oath of membership was taken, members were welcomed into the chapter, and the charter was presented to the president. A very interesting talk was then delivered by Mr. McDermott, after which questions on the organization, its purposes and objects, were discussed.

The first regular meeting date for the chapter was set for June 26, at which time it was suggested the election of officers for the year would be held.

July 31—The meeting was called to order by President E. H. Churchwell and following the regular business meeting, the education committee presented a group of interesting questions in the form of a quiz contest. It was planned originally that teams should be chosen to compete in this contest, thereby making the program more interesting, but due to the small attendance, the questions were presented to the entire group. During the business session that followed, there was some discussion on forming a sick committee. The discussion was brought about by the reported illness of one of the members who recently moved to Houston, Texas. It was thought, also, that a group insurance plan might be worked out which would be of benefit to the organization. A committee of one, consisting of Mr. Warehime, was appointed to look into the matter.

August 28—During the business session of the evening, a proposed city ordinance covering the installation and service of refrigeration equipment, presented to the city by the building engineers, was thoroughly discussed. It was decided that the secretary should communicate with the National Office requesting any available copies of ordinances in other cities, which could be used as a guide in forming an ordinance that would fit the needs of the refrigeration men in this territory.

The subject of a membership drive was brought up and discussed, and it was decided that two captains be appointed to head two teams consisting of all the mem-

Out of the Red—into the Black

this fall and winter with Chieftain

Your local Ice Cream Manufacturers and Beverage Bottlers are now pulling in their excess summer cabinets and cooler equipment.

They can be rebuilt, "good as new," during the winter months with "Chieftain" replacement compressors and condensing units.

You keep your men profitably employed.

Your customer is assured of another season of uninterrupted service, free from loss of sales and spoilage.

Our representative will help you sell this idea to your customer.

TECUMSEH PRODUCTS COMPANY

Factory & Gen. Offices—Tecumseh, Michigan. District Offices: Dallas, Texas; New York; St. Louis, Mo.; Detroit, Mich.; Denver, Colo.; Chicago, Ill.; Los Angeles, Calif.; London, Ontario, Canada; Decatur, Georgia. Export Dept. Detroit, Michigan.

bers in the chapter. The losing team would be required to entertain the winners with a banquet at the end of the contest, and the cost to each member of the losing team would be $1.50 to support the banquet. The contest would end at the next regular meeting September 25.

Ladies Auxiliary Notes

For information on the formation of an Auxiliary in your locality write—
Mrs. June Brunton, President
2223—9th Ave., Huntington, W. Va.
Mrs. A. H. Ross, Secretary
702 Nevin Ave., Sewickley, Pa.

KANSAS CITY AUXILIARY

On June 25, the ladies and their husbands met on the lawn of Mrs. Irwin's home for a picnic supper. After the supper, the men departed for their regular meeting, while the ladies continued with the report of their business to date. A motion was made and approved by the gathering that a small donation be given to the Penny Ice Fund. Mrs. Irwin gave an account of the sales of the Auxiliary's handwork, turning in the total proceeds of $15 from these sales.

Mrs. Hataway won the Bank Night drawing, and Mesdames Green, Sullivan, and Tramposh were appointed to take charge of the entertainment for the next meeting.

On July 23, the meeting was held in the home of Mrs. Meeker, and the evening was spent in entertainment with prizes going to Mesdames Tramposh and DeWilde.

On August 14, the evening was again spent in entertainment with prizes going to Mesdames Tramposh, Smith, and Meeker.

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R.E.M.A. TO HOLD FALL MEETING AT FRENCH LICK

MEMBERS of the Refrigeration Equipment Manufacturers Association and guests invited to meet with them at their 1940 Fall Meeting will gather at French Lick Springs, Ind., on October 9, 10 and 11.

According to E. A. Vallee, Vice President and Sales Manager, Automatic Products Company and President of R.E.M.A., the decision to hold this meeting was prompted by the Association's happy experience with its 1939 Spring Meeting held at French Lick. From the angle of attendance at sessions, that meeting was the most successful in the Association's experience. It is felt, there-

TAMPER PROOF SEAL

Only Virginia gives you this protection

Every cylinder of Virginia refrigerants is sealed with a tamper-proof red cellophane cap — **your proof that the refrigerant reaches you in the same condition it leaves our plant.**

But that isn't the whole story. For all Virginia refrigerants receive exhaustive laboratory analysis before shipment. And every Virginia cylinder is *individually* inspected.

You know what you're getting when you buy Virginia refrigerants—shipped to you in *sealed*, tamper-proof cylinders.

Buy your KINETIC'S FREON-12* VIA VIRGINIA

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A POPULAR LINE OF LOW-PRESSURE REFRIGERANTS

EXTRA DRY ESOTOO · V-METH-L · METHYLENE CHLORIDE

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fore, that in justice to the speakers and the importance of the subjects to be presented at the Fall Meeting this year that every effort should be made to get the maximum benefits that accrue through well-attended sessions.

The program for the meeting is being developed by a committee composed of J. D. Colyer, Wolverine Tube Company, Harold T. Hulett, General Electric Company, and E. J. Tweed, Dole Refrigerating Company. In addition to the formal program to be offered, most of the Association's several committees are expected to hold committee meetings.

Among the many matters of importance to be taken up will be final arrangements for the third annual All Industry Refrigeration and Air Conditioning Exhibition. Exhibition Manager R. M. McClure reports that already nearly as many exhibitor firms have signed up for a space in the 1941 All Industry Exhibition as took part in the 1940 show last January. It is confidentially expected that the 1941 All Industry Show will crack all previous records. A total of 145 booths already have been taken—only 15 less than the total number available for the "sell-out" last January.

HENRY VALVE FURNISH FLASHER SIGN TO JOBBERS

What is believed to be the first illuminated flasher display furnished to refrigeration parts jobbers has been released by the Henry Valve Company, Chicago, in connection with their line of Diaphragm Packless Valves. This display shows a packless valve in cross-section with full explanation of design and features of construction.

USE

SOLIDS·LIQUIDS·GASES·SOLIDS·LIQUIDS·GASES·SOLIDS

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FOR DRYING AIR REFRIGERANTS INDUSTRIAL GASES

DRIERITE is an Efficient, Rapid, Economical Dryer for all the Modern Refrigerants. Dries both by Chemical Action and Adsorption.

Used in Dehydrators by leading manufacturers and furnished to the Service Engineer by leading Supply Dealers.

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YELLOW SPRINGS, OHIO

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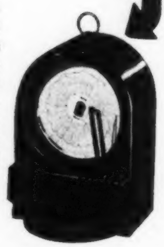

• Smart Service Engineers are using Practical Recording Thermometers to locate trouble, make records of completed jobs and stop call-back complaints. Hundreds in use. Strong, reliable and easy to operate. Find out how this Recording Thermometer will help you. Don't delay!

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PRACTICAL INSTRUMENT COMPANY
2717 N. Ashland Ave., Chicago

PRACTICAL RECORDING THERMOMETER WITH METAL CARRYING CASE—$18.00
Buy from Your Supplier

R.E.M.A. AND N.R.S.J.A. MEET TO DISCUSS PROBLEMS

AFTER a recent meeting between the R.E.M.A. Jobbers Relations Committee and the Manufacturers Contact Committee of the National Refrigeration Supply Jobbers Association, a report was issued by W. C. Allen, Chairman of the R.E.M.A. Committee covering the following subjects considered at the meeting.

The R.E.M.A. Committee was informed that the Jobbers Association will hold no convention sessions on Monday, January 13, 1941. The entire day will be reserved free of meetings to enable its members to contact exhibitors.

They requested that some method be established by the parts and supplies manufacturers to functionally classify their customers so as to eliminate, if possible, equipment manufacturers from purchasing parts on an original equipment basis for resale in the replacement trade.

They recommended that parts and supplies manufacturers investigate carefully applications from firms and individuals who request jobbing prices, to determine the potential in the territory of origin of the inquiry. The jobbers reported that wholesale trade outlets are growing faster than the industry, and that increased outlets appointed by manufacturers normally do not result in increased volume—unless it is clearly evident that the area to be served justifies the appointment of additional outlets.

The jobbers voiced a very definite opinion that their members should not engage in the manufacturing or remanufacturing business, and that manufacturers should not enter into the jobbing business. The jobbers feel that manufacturers should also discourage the practice of appointing jobbers to act in the dual capacity of jobber and manufacturers agent.

Ask Uniform Rating

The jobbers requested those manufacturers who make products which are listed and sold on a rated basis to adopt a uniform method of rating, to avoid confusion in making product comparisons.

It was suggested by the jobbers that man-

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Please send me the current issue of "ARTIC" Service News and put my name on the mailing list to receive future issues.
Name .....
Company ..... Position .....
Address ..... City ..... State .....

ufacturers use the slogan "Buy from your Jobber" in all advertising put out by the manufacturers.

Uniform Catalog Suggested

It was recommended that manufacturers adopt a uniform catalog size of 8½x11 inches on all printed and advertising material, and give consideration to a condensed catalog using fewer sheets than their regular catalog for use by jobbers' salesmen.

The jobbers have gone on record as not being in favor of local trade shows sponsored by an individual jobber, or any form of roundups or picnics where the jobber calls on his manufacturer-suppliers for financial support. If a regional show should be considered in any locality, the jobbers believe they should first secure the approval of R.E.M.A. before any attempt is made to promote the idea.

It was requested that those manufacturers who are not already doing so give consideration to granting a two percent cash discount. The jobbers claim that they are compelled to give a uniform cash discount to their customers and when not granted by the manufacturers it reduces their trade discount.

KEROTEST ANNOUNCES—

THE addition of two liquid indicators to their line of accessories.

Type 644, made in ¼ inch and ⅜ inch SAE flare sizes, comes complete with seal cap and gasket. These indicators are to be cataloged as follows:—

Cat. No.	Size	Code Word	List
6441	¼" SAE	AWATO	$3.00
6443	⅜" SAE	AWAUP	3.00

Standard discounts will apply to the list prices shown above.

We are now in production of these two items and solicit the opportunity of supplying your requirements.

NEW OPEN END WRENCH

BONNEY Forge & Tool Works, Allentown, Pa., have just announced a complete line of open end adjustable wrenches in 4, 6, 8, 10 and 12-inch lengths with capacities of ½-inch to 1-7/16-inch.

They are drop forged of high-grade alloy steel. Both handle and jaw are hardened and tempered in oil. Four tempered threads meshing in the forged jaw permit great

HOW to CUT COSTS and IMPROVE WINDING with Adjustable Coil Winder Heads

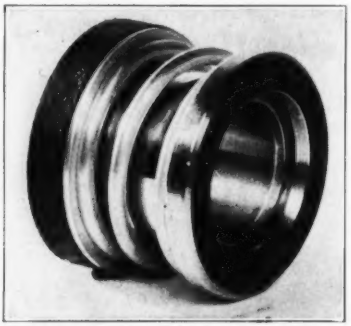
You save making up and storing dozens of wooden frames when you wind coils on IDEAL **Adjustable** Coil Winder Heads. Each is adaptable to a large number of coil sizes and types.
What's more, coils can be wound in sets, thereby eliminating the cost of soldering coils in series and insuring a better finished job.

Write for FREE Folder

Get the facts on how to cut costs and improve winding with IDEAL **Adjustable** Coil Winder Heads. Find out, too, how to insure positive speed control and constant tension with the new IDEAL Coil Winder Drive. Address card to—

IDEAL COMMUTATOR DRESSER COMPANY
1093 Park Avenue **Sycamore, Illinois**

IDEAL COIL WINDING EQUIPMENT



When Other Seals Fail Try
SYNTRON
"ANTI-FRICTION"
SHAFT SEALS
ON NEW—AS WELL AS ON OLD, WORN AND SCORED SHAFTS.
A Complete Line.
See Your Jobber.
SYNTRON CO., HOMER CITY, PA.

pressure on the handle. They will not break or wear in the gear teeth and allow play, thus eliminating the possibility of the jaw slipping off the nut.

Jaws are designed to fit square or hexagon nuts and are unusually thin permitting use of these wrenches in normally inaccessible places.

BONNEY OPEN END WRENCH.

Bonney open end adjustable wrenches are fully chrome plated with polished jaws. They will meet every nut turning need, where a fixed opening wrench of the proper size is not available.

STORAGE BATTERY FOR FLASHLIGHTS

A RECHARGEABLE flashlight battery similar in principle to the well known automobile storage battery is announced by the Ideal Commutator Dresser Company, 1093 Park Avenue, Sycamore, Illinois.

Although small in size to fit all popular two-cell, 1¼-inch size D flashlight cases, it is proven through actual heavy duty service to be dependable, long lived and economical. Large users of flashlights can enjoy big savings through the use of the Ideal battery for it can be charged time and time again. In heavy use one discharge is equal to a pair of ordinary dry cells. The rechargeable feature makes it convenient to use only while light is bright, and charge again when light gets dim.

An ingeniously arranged chamber and vent plus semifixation of the electrolyte makes it spillproof. The plates are over ¼ inch thick and connected to terminals by reinforced electrodes so that the battery is rugged to withstand rough handling. The case is of transparent Lucite. All batteries are "use conditioned" at the factory just like an automobile engine is broken in on the block.

Small Charger Available

A small charger consisting of transformer and rectifier plates makes it easy to keep the battery always fully charged. Merely

MORE
for your money!
That's what you get from AIRO
☆ MORE of the highest quality merchandise at the very lowest price.
☆ MORE friendly, helpful attention to your problems.
☆ MORE of that speedy one day service Airo customers have learned to expect.
For PLUS VALUE—for more than your money's worth, buy your REFRIGERATION and AIR CONDITIONING
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You Know . . .
RATED CAPACITY is ACTUAL CAPACITY when it's a

Rempe UNIT COOLER
Rempe units are dependably rated under actual operating conditions and guaranteed to perform as rated. No need for oversized units to assure calculated performance. Wide selection of sizes and types meets all space cooling conditions.
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Panel Coolers ▲ Fin Coils ▲ Blower Units
▲ Coil and Drain Baffles ▲ Pipe Coils
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CLAIMS! CLAIMS! CLAIMS!

We make no wild 60 second delivery claims—we make no claim that we are offering such ridiculous prices as to be giving merchandise away—as a matter of fact we do not make any of the exaggerated claims which greet your eye every day.
We do claim however, that your order will be shipped the day it is received, that our prices are highly competitive with the rest of the trade and that we back our merchandise with a 100% guarantee against workmanship and material, BECAUSE WE WILL HANDLE ONLY NATIONALLY KNOWN AND RECOGNIZED QUALITY PRODUCTS

SEND FOR OUR 200 PAGE CATALOG TODAY

Write Dept. RE2 for our free catalog. Sent on request only

AUTOMATIC HEATING & COOLING SUPPLY CO.
647 W. LAKE ST. CHICAGO, ILL.

plug into convenient 110 volt, 60 cycle wall socket. The recommended charging time is 12 hours for which the cost is only about 1/10th of one cent per charge based on a five cent kilowatt hour rate. A clip is also available for charging from a six-volt automobile battery. For large users a "Gang Charger" can be supplied.

The Ideal Storage Battery for flashlights is recommended for all regular flashlight users, particularly plant maintenance men, watchmen, messengers, meter readers, repairmen, policemen, automotive vehicle drivers, garage and service station men, railroad companies, sportsmen, airplane pilots, army and navy departments, etc.

U.E.I. MOVING TO LARGER QUARTERS

TO provide greater training facilities for its students, Utilities Engineering Institute, 404 N. Wells St., Chicago, will move to larger quarters about the middle of September.

After fourteen years devoted to training men for the refrigeration and air conditioning industries, the school now plans to extend its activities to other fields.

In discussing the new program, E. P. Sorensen, president of the Institute, said, "For years we have felt something should be done to assist ambitious men who, because of limited education or for other reasons, are not qualified for U.E.I. training in refrigeration and air conditioning.

"In our efforts to supply the service branch of the industry with the very finest talent, we have found it necessary to create a national interest among mechanically minded men in refrigeration and air conditioning and from the volume of inquiries received accept those who indicate they possess potential possibilities of becoming capable servicemen.

"This strict policy has made it necessary to reject many deserving men who apply for training. Extending our activities to the automobile industry and other fields, places us in position to offer a diversified type of training to men lacking the basic qualifications for gainful employment in the refrigeration and air conditioning industries.

"For the good of the industry, as well as ourselves, we shall continue to accept only such men for training whom we feel will reflect credit to themselves, our school, and this great industry," Mr. Sorensen stated.

HERMETIC
Rebuilding & Exchange Service
GENERAL ELECTRIC • GRUNOW
MAJESTIC • WESTINGHOUSE
also parts for these units
Orders shipped same day as received. You can return old unit later in our crate. ONE YEAR UNCONDITIONAL GUARANTEE. Write for catalog on your letterhead.
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1101-03 N. 24th Avenue
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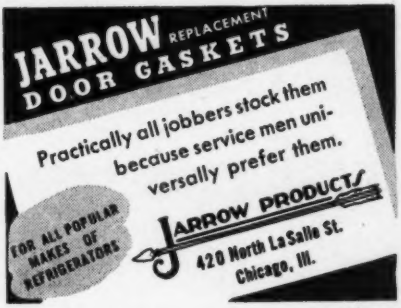
on the edge of Chicago


JARROW REPLACEMENT
DOOR GASKETS
Practically all jobbers stock them because service men universally prefer them.
FOR ALL POPULAR MAKES OF REFRIGERATORS
JARROW PRODUCTS
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PARTS for SERVICE MEN

KRUPP-MADE means HIGH-GRADE

Dehydrators . . . Strainers . . . Line Valves . . . Shut-off Valves . . . Water Regulators . . . Gauge Sets . . . all made by Krupp, all of the very best quality. Precision manufacturing and first-rate engineering pay dividends to you in fewer call-backs and satisfied customers. Don't fail to write for our new catalog.

Every service man should have a copy of our complete catalog. Write at once, today, for yours.

CYRUS SHANK COMPANY

625 West Jackson Blvd., Chicago, Illinois

The new headquarters will accommodate general offices and shops for both Utilities Engineering Institute and Auto-crafts Training Co. Located in a school neighborhood, at Belden and Wayne Avenues, Chicago, adjacent to De Paul University and the Presbyterian Theological Seminary, the new home of U.E.I. provides 24,000 square feet of floor space.

\$ \$ \$

GENERAL CONTROLS TO HAVE LARGER QUARTERS

ON or about September 20th, General Controls Co., Glendale, California, manufacturers of pressure, temperature, and flow controls, will move into a new and permanent factory which is rapidly approaching completion on an eleven acre site at 801 Allen Avenue in Glendale.

The new plant will house the general offices, research and testing laboratories and complete and new manufacturing facilities. The Los Angeles screw machine division of General Controls will also be incorporated in the new plant.

This plant expansion, according to company officials, reflects the ever-increasing demand for the company's products throughout the country from the many branches of industry it serves.

They also announce a change in address of their Kansas City office to 421 Southwest Boulevard.

Larger quarters at this new address will permit the company to carry larger stocks and increase the scope of service to customers in that territory.

\$ \$ \$

NASH-KELVINATOR CORPORATION REPORTS $901,939 PROFIT

A NET profit of $901,939 for the quarter ending June 30, 1940, was reported recently following a Board of Directors meeting of Nash-Kelvinator Corporation here. This is after all charges, and provision for federal income tax.

The profit reported is equivalent to 21 cents a share on 4,291,306 shares of $5 per capital stock outstanding, and compares with a net profit of $108,264 for the corresponding period of last year.

At the end of the March quarter of 1940, Nash-Kelvinator Corporation reported a

$2.25 and your old float valve suitable for rebuilding

SAVE 50% UNDER DEALER PRICES ON GUARANTEED REPLACEMENT FLOAT VALVES

You save from 25% to 50% under dealer prices when you trade in your old float valves at Hasco. Every Hascobilt float valve has been taken apart, cleaned and inspected. All brass parts bright and shiny . . . Electro-Tin Plated—Satin Silver Finish Header . . . Reconstructed with *Brand New* Stainless Steel Needle and Seat, New Screws, Washers and Pins. *Guaranteed* in every respect to be as good if not better than the float valve which came in the evaporator when new. Send your old float valves to Hasco and treat yourself to extra profit.

HASCO, INC. GREENSBORO, NORTH CAROLINA

A copy of our *New 1940 Catalog* will be mailed free upon request.

GREATER OPPORTUNITIES Lie Within Your Own Business!

INCREASE YOUR PROFITS

WITH U. E. I. TRAINING

Alert servicemen make more money, have fewer call-backs, and increase customer satisfaction through the knowledge gained by U.E.I.'s easy, spare time training program.

In an industry such as refrigeration and air conditioning, which is constantly changing, the importance of possessing a well-grounded knowledge of *all* the fundamentals cannot be overemphasized.

FOR COMPLETE INFORMATION WRITE

UTILITIES ENGINEERING INSTITUTE, Dept. 592, 404 N. WELLS, CHICAGO

profit of $392,941, and for the nine months of the current fiscal year, which begins October 1st, the corporation reports a net profit of $1,307,878 after all charges and provision of $251,000 for federal income tax. This compares with a loss of $1,330,934 for the first nine months of the previous fiscal year.

CECIL BOLING RESIGNS

IT was with considerable regret that Melchior, Armstrong, Dessau Co., announced the resignation of their Vice President and Director, Cecil Boling on August 1, 1940.

Mr. Boling has been with the company for the past six and one-half years.

ALCO VALVE ANNOUNCES NEW REPRESENTATIVES

ALCO Valve Company announces the appointment of new sales representatives in the Southwest, succeeding Mr. Kenneth W. Way, deceased. South Texas will be handled by E. G. Langhammer, 486 Main Avenue, San Antonio, Texas. Mr. Langhammer has specialized in controls for refrigeration for some time.

Mr. Douglas Doan, 1218 Magnolia Building, Dallas, Texas, will represent Alco in North Texas and Oklahoma. Mr. Doan was at one time an air conditioning engineer for Chrysler-Airtemp.

The Inter-Mountain Territory will be covered for Alco by the Western Thermal Equipment Company, 2615 Lowell Boulevard, Denver, Colorado. G. B. Bloom is the principal of this company and W. M. Snider is the Denver Manager.

NEW CATALOGS AND BULLETINS

KRAMER TRENTON COMPANY, Trenton, New Jersey, has issued a new 64-page catalog of Kramer products which is now available to the trade.

Included in the equipment listed are Triple Trough baffles for walk-in and reach-in coolers, coils of all types including bare tube coils, special coils, coils for walk-in coolers, beer blowers, and unit coolers of all types. Other items are heat interchangers and ice makers, both commercial and domestic.

A very interesting and useful section of the catalog is devoted entirely to engineering

ALTER SERVICE IS PROMPT

—and we have everything you need in

AIR CONDITIONING and REFRIGERATION PARTS and SUPPLIES

Write for free catalog. Please use your letterhead.

THE HARRY ALTER CO. 1728 S. MICHIGAN AVENUE, CHICAGO, ILL.

3 CHICAGO BRANCHES, NORTH, WEST, SOUTH

NEW YORK BROOKLYN BRONX JAMAICA

NEWARK DETROIT CLEVELAND ST. LOUIS

MAN WANTED to Sell *This Profitable*

ACTION-AIR System in Your Territory . .

STOPS
Spoilage
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Shrinkage
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Taste Transfer
*
Excessive Frosting
*
Proved Since 1932

Act now and get the exclusive rights to this fast-selling Action-Air System . . . and solve air circulation problems in coolers. Convince customers in one easy demonstration how Action-Air prevents dead air spots, freezing zones, humidity difficulties and excessive frosting. Also reduces shrinkage and spoilage, saves operating costs and electricity—**it pays for itself!**

Be the only dealer in your territory to sell these machines—create new customers and repeat business. Write today for this profitable, exclusive sales proposition.

THE BROWN CORP., 650 Bellevue Ave., SYRACUSE, N. Y.

ACTION-AIR SYSTEM

data. There are 18 pages in all containing detailed methods of calculating heat losses in various spaces. The many tables contained in this section will be found useful in the engineering of commercial installations.

PEERLESS OF AMERICA, INC., 515 W. 35th Street, Chicago, have just issued a new catalog on their cold plates, known as "Zero

Pads." The bulletin fully illustrates the revolutionary design of Zero Pads which does away with tubing and the need for a vacuum. This new construction makes the Peerless cold plate all prime surface and actually thinner than a lead pencil! Various types of installations, and the many applications of Zero Pads are shown in detail. Complete prices are listed and a helpful table showing standard fittings is included. Copies will be mailed on request. When writing ask for Bulletin CP-10.

GENERAL ELECTRIC issues a new 56-page booklet entitled "Low Cost, Dependable Condensing Units" by the air conditioning and commercial refrigeration department, General Electric Co., Bloomfield, N. J.

The new booklet describes condensing units from 5 to 60 hp. for both refrigeration and air conditioning installations. Prepared especially for engineers, architects and contractors, the booklet is largely devoted to performance and application data, compressor accessories, instructions for capacity modulation, multiple unit operation, and other engineering information needed in the design of large-scale refrigeration and air conditioning systems. A copy will be sent on request.

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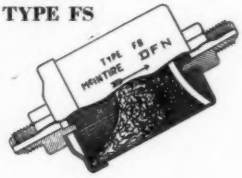


The non-clogging and efficient Progressive Filter Assembly of the

D F N SYSTEM

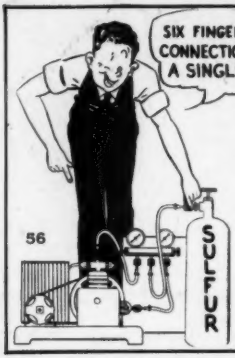
for the control of moisture, sediment and acid.

ASK FOR CAT. R-6

Buy from your jobber—he stocks for your service.

McINTIRE CONNECTOR CO.

Newark **New Jersey**



Superior Quick-Couplers

—are exactly what the name implies—handy little swivel couplers for "quick-coupling" charging lines, gauge lines, etc. to flare fittings—without the use of wrenches.

A soft composition gasket in the swivel connection does the trick. Run 'em up "finger-tight," and they're "gas-tight." Gasket easily and inexpensively replaced.

Ask your Jobber—or write for Catalog

SUPERIOR VALVE & FITTINGS COMPANY
1509 WEST LIBERTY AVENUE • PITTSBURGH, PENNA.
EXPORT: 100 VARICK STREET • NEW YORK, N. Y.

COLD CONTROLS & EXPANSION VALVES

repaired or exchanged
at the following prices, F.O.B. Chicago

Automatic Expansion Valves (All Makes)	$1.25
Thermostatic Expansion Valves	3.00
Automatic Water Valves	2.00
Domestic Cold Controls (Modern Type)	2.00
Commercial Controls (Temp. or Pressure)	2.50
Commercial Dual Controls	3.00

ALL WORK GUARANTEED FOR 90 DAYS
Write for quantity prices

NEW DUTY
2424 Irving Park Blvd., CHICAGO

CONTROL REPAIR SERVICE

Commercial and Domestic Controls reconditioned like new at a small cost. All work guaranteed for one year. We also repair all types of relays with same guarantee.

UNITED REPAIR SERVICE
342 W. 70th Street, New York City
TRafalgar 4-2557-8

Classified Ads

Rate: Two Dollars for fifty words or less. 30 cts. for each additional ten words or less.

FOR SALE—One Anheuser-Busch "Big Bertha" refrigerated cabinet. Size 9' long x 48" wide x 37" high, with four compartments. Century single phase motor, ½-h.p., 110/220 volts, 60 cycle, 1750-r.p.m. York model 417FA compressor, range 10-50° F. Available at South Bend, Indiana. Write Peter Eckrich and Sons, Inc., Kalamazoo, Mich.

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